Managing Fire, Understanding Ourselves:

Human Dimensions in Safety and Wildland Fire

13TH INTERNATIONAL WILDLAND FIRE SAFETY SUMMIT
& 4TH HUMAN DIMENSIONS OF WILDLAND FIRE

BOISE, IDAHO, USA • APRIL 20-24-2015 • #IAWFCon15

HOSTED BY:

International Association of WILDLAND FIRE

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International Association of Wildland Fire

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WELCOME

Wildland fire management has risen to the forefront of land management and now receives greater social and political attention than ever before. As we progress through the 21st century, these areas of attention are continually presenting challenges never experienced before.

We may consider ourselves well positioned to move into the future. Our knowledge of many areas of fire management pertaining to the physical fire environment, ecological interactions, science and technology, and management strategies and tactics has never been greater. But, an improved understanding of human behavior - at individual, group and organizational levels – is vital to making fire management safer, more active, progressive, and adaptable. This is a far-reaching topical area that includes, but is not limited to, firefighter and public safety, best practices in safety training and operations, safety related research, new approaches to safety, fire response, safety issues in wildland urban interfaces, training, equipment and technology, risk assessment, risk informed decision-making, high reliability organizations, sense-making, shared responsibility, preparedness, organizational discipline, organizational performance, organizational breakdown, decision making, communications, resilience, risk, decision support, community and homeowner fire protection and hazard mitigation, fire education, and social, economic, and political effects of fires. Each year's fire seasons around the world reinforce that we have much to respond to and to learn in these areas.

The International Association of Wildland Fire (IAWF) is extremely proud to present the 13th Fire Safety Summit and the 4th Human Dimensions in Wildland Fire Conferences this year together for the first time. The IAWF recognizes the importance for both these areas to wildland fire management and the challenge for interested individuals to attend two separate venues. As a result, we feel that a combined single conference will afford the maximum benefits of a substantially elevated conference program during a single event.

This conference is designed to be innovative, revolutionary, and not focused only on a single component, but rather on the many aspects of human behavior and safety in wildland fire management. The conference will bring together at one time the significant body of knowledge about these program concerns. It will provide a forum for discussion, a stage where workshops, oral presentations, poster paper presentations, special sessions, workshops, and plenary presentations by leading experts in the field can facilitate the sharing of what is known, what needs to be learned, what lies ahead, how to advance knowledge, and how to use this knowledge to effectively respond to increasing concerns. During this conference you will be able to explore ways to expand collaborations, gain new knowledge, discuss the latest relevant research findings, learn about and from management treatments, engage in policy discussions, and conduct global fire management interaction.

On behalf of the International Association of Wildland Fire, all conference sponsors and partners, I welcome all participants and hope that this conference will meet, and even exceed your expectations of increasing awareness, knowledge, and capability in this important field in addition to networking with peers to establish future avenues of discovery. We hope that you will enjoy attending and gain significant information from what promises to be the most informative, enlightening, and powerful conference to date on safety and human dimensions in wildland fire management.

If you were not previously a member of the IAWF, you are receiving a one-year membership in the association included in your registration. By participating as an active IAWF member you can help to improve communication between firefighting organizations, enhance firefighter and public safety, increase our understanding of wildland fire science, and improve our ability to manage fire. Your membership in the IAWF provides you with a connection to other wildland fire professionals from across the world. Our membership, which is truly international, includes professionals from the fields of fire ecology, suppression, planning, contracting, fire use, research, and prescribed fire. Our members are scientists, firefighters, mangers, contractors, and policy makers. As an association, we are unique in that we represent all areas of wildland fire management.

On behalf of the Board of Directors of the IAWF, thank you for your support of our association.

Thomas Zimmerman

ABOUT IAWF

The International Association of Wildland Fire (IAWF) is a non-profit, professional association representing members of the global wildland fire community. The purpose of the association is to facilitate communication and provide leadership for the wildland fire community.

The IAWF is uniquely positioned as an independent organization whose membership includes experts in all aspects of wildland fire management. IAWF's independence and breadth of global membership expertise allows it to offer a neutral forum for the consideration of important and at times controversial, wildland fire issues. Our unique membership base and organizational structure allow the IAWF to creatively apply a full range of wildland fire knowledge to accomplishing its stated mission.

Vision: To be an acknowledged resource, from the local to global scale, of scientific and technical knowledge, education, networking and professional development that is depended on by members and partners in the international wildland fire community.

INTERNATIONAL JOURNAL OF WILDLAND FIRE

Our official fire science journal, published on our behalf by CSIRO, is dedicated to the advancement of basic and applied research covering wildland fire. IAWF members have access to this leading scientific journal online, as a members benefit. For those members who want to receive the hard copy version of the journal, they may receive it at the IAWF discounted rate of US $220, which includes your IAWF membership and a 1-year subscription to WILDFIRE.

WILDFIRE MAGAZINE

All IAWF members receive WILDFIRE magazine, official publication of the IAWF. Our authors submit fire articles from all corners of the world and our topical editors cover a broad array of important issues in wildland fire. We encourage you to submit articles and photographs for inclusion in the magazine. Visit www.wildfiremagazine.org for more information such as Writer's Guidelines.

There are so many reasons to become a member of the International Association of Wildland Fire but most importantly, the opportunity to be a member of a professional association that is committed to facilitating communication and providing leadership for the wildland fire community. Join today at www.iawfonline.org.

International Association of Wildland Fire
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International Association *of* Wildland Fire

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GENERAL INFORMATION

BANKING
Boise Centre has one ATM within the facility located in the lobby. (There is a $2.50 fee per transaction.)

CONFERENCE PROCEEDINGS
All those who present a poster and oral presentation are encouraged to submit an extended abstract or full paper for the Conference Proceedings. The proceedings will be published by the International Association of Wildland Fire and will be made available online. The deadline for submissions will be June 1, 2015. Visit the conference webpage for the guidelines and template.

DINING
Coffee/Tea will be provided each morning of the conference; coffee/tea and refreshments will also be provided during morning and afternoon networking breaks. Lunch will be provided on Wednesday. All breaks will be located in the Exhibit Hall, Eagle. The luncheon on Wednesday will take place in the middle section of the ballroom - Hawk.

EXHIBITORS
The exhibitors will be set up all day Tuesday and Wednesday through the Social Reception on Wednesday Evening. The Exhibit Hall is located in a section of the ballroom – Eagle. We encourage you to visit our sponsors and exhibitors during the Social Receptions on Tuesday and Wednesday, each morning and during lunch and breaks.

INTERNET/CHARGING STATIONS
Boise Centre offers a complimentary 5MB Wi-Fi network designed for event attendees. This service is available throughout the facility. There are 4 charging stations located in The Meadow.

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To download the mobile app:
- iPhone and iPad users--search "EventBoard" on the Apple App Store.
- Android users--search " EventBoard " on the Google Play Store.
- Our Conference will be listed under All Conferences
- Click on our conference to enter the mobile app site.

Thanks! We hope you enjoy the mobile app!

PARKING
Parking for the Boise Centre is available at primary parking facilities through an agreement with the Downtown Public Parking System.

PARKING RATES
First Hour Free
Hourly $ 2.50
All Day $12.00

POSTERS

Poster will be displayed on panels in The Meadow. The formal poster presentations will be on Wednesday from 1:30-2:30 pm. Please see the detailed program for the list of posters. All posters will be left up the entire three days, and will be staffed by the authors during the formal presentation on Wednesday.

Poster presenters may place posters anytime beginning Monday Evening from 5:00-8:00 pm, please ensure your poster is placed no later than 12:00 pm on Wednesday, April 22nd. We will provide you with the means to attach your poster (pushpin, Velcro, clips).

PRESENTERS

Please note that all presenters will be required to use the computers we are supplying; this will ensure smooth transitions between presentations.

We have provided an on-line submission system to upload your presentations. All oral presenters are required to turn in their presentations the day prior to their session. This is very important so we can load your presentations and make any adjustments that may be needed before your presentation. Please do your very best to help us out with this! Please do not upload your presentation until it is finalized, otherwise you will need to withdraw and resubmit.

You can either use the online system or you can upload your presentation at the speaker table in the registration area onsite. Online Submission System: https://iawf.submittable.com/submit/40392

SIDE MEETINGS

We have a room available for impromptu side meetings throughout the week; Payette River. There is a schedule on the door, sign up at your desired time, please respect others by staying to your schedule time.

SPEAKER READY ROOM

A Speaker Ready Room is available for all conference presenters to preview their material prior to presentation. The Speaker Ready Room is located in the Perch room which is located off the foyer.

SUSTAINABILITY / RECYCLING

Boise Centre has taken many sustainable measures to move toward a more environmentally friendly venue. Boise Centre is equipped with a single stream recycle compactor for all recyclable materials. Recycle containers are located throughout the facility.
Some of our specific initiatives regarding energy and waste conservation are listed below.

ENERGY EFFICIENCY

- Upgrading fluorescent lighting systems from T-12 to T-5 and T-5 HO
- New lighting controllers that reduce output by 50% for move in/move outs
- Interactive Lighting and HVAC control systems send heating or cooling into setback mode when lights are turned off
- Building is heated with Boise City's geothermal water system
- Natural light in the main lobby areas provides for reduced lighting, particularly during set up and tear down
- Energy reducing motor control drive upgrades to the cooling tower and chiller

WASTE REDUCTION

- Partners with Allied Waste and Western Recycling to recycle all forms of paper, plastic and metal materials
- Designated compactor for all recyclable materials
- Partner with Sustainable Futures, a nonprofit company specializing in sterilizing glass wine bottles and re-selling to local wineries
- Initiated a composting program with local neighborhood co-op farms to provide composting materials
- All plastic cups, flatware, and "to go" boxes are made from corn products
- All paper cups, plates, and napkins are made from recycled, compostable paper products
- Individual water bottles are replaced with filtered water stations in public areas
- Reduce paper waste by replacing traditional guest signage inside the facility with new digital technology

Boise Centre makes every effort to recycle all materials recyclable including donating surplus meals, compostable food waste, and wine bottles. Water stations are equipped with bottle fillers.

QUESTIONS AND INFORMATION

If you have any questions or need any assistance please visit the registration desk which will be located in the foyer area outside of the ballroom. Boise area information has been provided by Boise Convention & Visitors Bureau.

As outbreaks of wildland fire are increasing due to global change, ecological disturbance and damage to local communities become serious. The conference provides a platform for 3,000 fire management experts and business officials to discuss fire management strategy and to share business opportunities.

The 6th International Wildland Fire Conference

12-16 October 2015
PyeongChang, Korea

Host city of the 2018 Pyeongchang Olympic Winter Games!

Theme **Fire of the Past, Fire in Future**
Registration at www.wildfire2015.kr

Sessions

- Plenary sessions
- Parallel sessions
- Global Network session
- Regional sessions
- Field study tour
- Student thesis presentation competition

Plenary Topics

- Legacy of fire
- Community and wildland fire
- Towards a cohesive global fire management strategy
- Application of technology to wildland fire management
- Protecting the global natural and cultural heritage from fire

Exhibition

- Wildland fire apparatus
- Aerial firefighting equipments
- Fire suppression instruments
- Protective gear
- Aircraft navigation system
- Fire surveillance cameras
- Fire danger forecast system
- Fire situation control system
- Fire dissemination forecast system

Participants Registration

Online registration is available now at (Home → Registration → Conference Registration) after sign-up for the 6th IWFC website.

Full Registration Fees

- **Regular/On-Site:** USD 550
- **Pre-registration:** USD 495 (10% discount)
- **Early-Bird:** USD 440 (20% discount)
- **Students:** USD 280

Exhibition Registration

- **Shell Scheme Construction:** USD 2,500
- **Raw Space:** USD 2,250/9m^2 (Available for more than 18m^2)

* **Early-Bird Discount Rate:** 10%

Host

KOREA FOREST SERVICE

Gangwon Province

Main Partner Organizations

UNISDR · FAO · GFMC · ITTO · USFS · CIFFC · International Association of Wildland Fire · afac · AFoCO · bushfire&natural HAZARDS CRC · Working on Fire International Holdings Ltd

SOCIAL EVENTS

TUESDAY – WEDNESDAY

SILENT AUCTION

Expo Hall – Tuesday, 10:00 am - Wednesday, 6:00 pm

Check out and bid on the silent auction items which will be displayed in the exposition hall until 6:00 pm on Wednesday. All proceeds from the auction will be divided between the National Fallen Firefighter Foundation; Wildland Firefighter Foundation and International Fire Relief Mission.

MONDAY

AFTER HOURS NETWORKING

Monday, April 20th 7:00 pm

10 BARREL BREWING COMPANY

830 W Bannock St.
http://www.10barrel.com
10 Barrel started back in 2006 with three guys in Bend Oregon who shared one simple mindset; brew beer, drink beer, and have fun doing it! Since that time their brewery has grown, but they will always be the same. Cheers!

TUESDAY

IDAHO REGIONAL RECEPTION

Tuesday, April 21st • 5:00 -7:00 pm
Boise Centre – Expo Hall

The Chef at the Boise Centre has prepared for us a special menu featuring various delicious Local/Regional Foods.

Visit the "Boise" Table to learn information about what Boise has to offer. Materials provided by the Boise Convention and Visitor Bureau.

Check out and bid on the Silent Auction Items. All proceeds from the auction will be divided between the National Fallen Firefighter Foundation; Wildland Firefighter Foundation and International Fire Relief Mission.

MUSIC PROVIDED BY DAN COSTELLO

Blending classical, bluegrass, funk, rock, jazz, and folk may be difficult, even hazardous, but singer-songwriter and guitarist Dan Costello is up to the challenge. His performance experience ranges from hard rock bands to jazz ensembles to medieval instrumental troupes. He earned a Bachelor of Music degree in classical guitar in 2001 and works both in and out of the scholastic realm as a performer, accompanist, editor, composer, arranger, lyricist, teacher, and producer. Costello is an outspoken advocate of local grassroots music.

WEDNESDAY

Wednesday, April 22nd
5:15-6:30 pm
Boise Centre – Expo Hall

Don't miss this opportunity to network with your fellow conference participates. We've kept the hors d'oeuvres simple tonight so you can plan a fun evening out on the town afterward. Boise has many wonderful eating establishments within walking distance of the Boise Centre.

The Silent Auction will end at 6:00 pm tonight, don't forget to check out and bid on the Silent Auction Items. All proceeds from the auction will be divided between the National Fallen Firefighter Foundation; Wildland Firefighter Foundation and International Fire Relief Mission.

THURSDAY

AFTER HOURS NETWORKING

Thursday, April 23rd 6:00 pm

PROTO'S PIZZERIA NAPOLETANA

345 South 8th Street
http://www.protospizza.com/site/#protos-boise

Proto's will be donating 10% of their proceeds back to our three charities for business conducted at that location throughout the day on Thursday.

Proto's Pizza has been recognized in many publications including Bon Appetit magazine. The Pizza experience had been elevated to table service, linen napkins, and delicious wines with a full bar to make it a true dining experience.

Proto's has been tossing pizza for a long time now. Pam has gone on to open several more locations. No matter which Proto's you choose as your favorite, one thing will never change, and that is their passion to create and bake for you the best pizza you will ever eat.

FEATURED PRESENTERS

OPENING SESSION

BOISE FIRE DEPARTMENT HONOR GUARD

The Boise Fire Department Honor Guard appeared at their first public ceremony in February 1999. The team proudly displays colors at departmental events such as the Annual Fire Safety Symposium, Recruit Academy graduation ceremonies, award banquets, parades and funerals.

BOISE FIRE DEPARTMENT PIPES & DRUMS

Through the support of the Fire Chief, Fire Department and Local 149, the Boise Firefighters Pipes and Drums established in March of 2008. With eight founding members, Boise Firefighters Pipes and Drums began to spread talent and good-will throughout Boise, the Treasure Valley, and as far away as Alaska, Texas, and both east and west coasts. Members dedicate a substantial amount of personal time to improving musical performance. Boise Firefighters Pipes and Drums recently celebrated their 200th performance and continue to honor fellow brothers and sisters in the fire service while upholding the values of the Boise Fire Department: Integrity, Dedication, and Service.

PLENARY SESSION

DISASTER, DEVASTATION, RESILIENCE AND RECOVERY: THE JOURNEY OF STRATHEWEN PRIMARY SCHOOL

Jane Hayward, Principal, Strathewen Primary School, Victoria, Australia

Strathewen Primary is a small school, just over one hour north east of Melbourne. Located at the base of a wooded valley and adjacent to National Park forests, preparation for the fire season had always been a priority. The school was in a vulnerable position, in a high fire risk area. The state of Victoria had been experiencing drought conditions for almost ten years and the risk of bushfire was higher than ever. We thought we knew what to expect of a bushfire and had prepared accordingly.

In taking on the position of teaching Principal in 2007, I assumed leadership of a school which had experienced long term staffing stability was recognised for high performance and boasted a dedicated and involved community. This was a school setting in which the village was genuinely raising the children. My role as teaching Principal, though challenging, was a very special one. No one could have predicted the disaster which was to impact the school and its community only two years later.

The Black Saturday bushfires in 2009 made headlines around the world. On that day, as temperatures soared, fires burned across the entire state. The conditions were ideal for a fire storm and that was what struck Strathewen.

The loss across the State of Victoria was significant. The loss in Strathewen itself was devastating. Our school was destroyed. Local homes, properties, businesses and infrastructure were gone. Livestock and pets were lost. Strathewen, with its population of just over 200, suffered the highest loss of human life.

There is no preparation for educational leadership following such extensive trauma and loss. Promptly relocating to a temporary school site was vital. All members of both the school and wider community were impacted by this disaster. The school's journey through the years following Black Saturday has been difficult one. The human side of disaster is challenging and often heartbreaking. Dealing with post trauma issues in children and families has been a lengthy process and continues today.

Six years on, we have returned to Strathewen valley, to a purpose built, fire rated school and our recovery journey continues.

Bio: Jane lives in rural Kinglake, Victoria, Australia with her husband Paul and has two adult children who are off on their own adventures- most of the time. Jane began teaching at age 20 in a small, rural school in northern Victoria and has since worked in a variety of school and education settings. With almost 30 years of teaching in Victorian primary schools behind her, she is passionate about education, learning and the small school setting. Jane's focus on student welfare and well-being underpins all that she does.

Prior to Black Saturday, Jane taught at Middle Kinglake Primary School for ten years, before taking on the position of teaching Principal at Strathewen Primary School in 2007. Both Middle Kinglake Primary School and Strathewen Primary School were destroyed in the 2009 bushfires. The local area, farms, homes, community infrastructure and many of the surrounding townships were also devastated. Jane has led her school community through some very challenging times. As the Principal of a small school, Jane continues to teach the school's senior class of 8-12 year olds, four days per week.

PLENARY SESSION

WILDFIRE POLICY AS A SOCIO-ECOLOGICAL PROBLEM

Toddi Steelman, Executive Director and Professor,
School of Environment and Sustainability, University of Saskatchewan

There are fundamental spatial and temporal disconnects between the policies that have been crafted to address our wildfire challenges and the scales at which the problems occur. The biophysical changes in fuels, wildfire behavior and climate have created a new set of conditions for which our existing policies are poorly suited. To address these challenges, a re-orientation of goals is needed to focus on creating an anticipatory wildfire governance regime focused on social and ecological resilience.

Bio: Dr. Steelman's research focuses on improving the governance of environmental and natural resources, emphasizing science, policy, and decision-making interactions. She places special emphasis on the role of the public and community in decision-making. She is Co-director, with Dr. Branda Nowell, of the Fire Chasers project at North Carolina State University (research.cnr.ncsu.edu/blogs/firechasers/).

PLENARY PANEL SESSION

GLOBAL WILDLAND FIRE PERSPECTIVES: AGENCY PERSPECTIVES OF FIREFIGHTER SAFETY AND HUMAN DIMENSIONS IN WILDLAND FIRE MANAGEMENT AND THE EMERGING IMPORTANCE OF THIS AREA

MODERATOR: Marjie Brown, Consultant, ScienceFire Communications, Inc

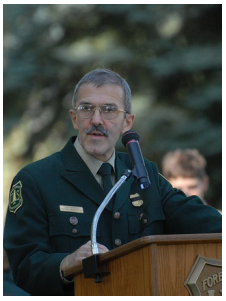
PANELISTS:

- **Jim Karels,** President, National Association of State Foresters (NASF) and State Forester, Florida, USA;
- **Tom Harbour,** Director of the Fire and Aviation Management program for the US Forest Service. National Headquarters in Washington, D.C., USA
- **Dick Bahr,** Deputy Director Management & Programs, DOI, Office of Wildland Fire, USA
- **Alan Goodwin,** Chief Fire, Officer Department of Environment, Land, Water and Planning, Australia
- **Marc Castellnou,** Fire Manager, Catalan Fire Service, President of Pau Costa Foundation, Spain

Jim Karels, State Forester, has been the Director of the Florida Forest Service since 2008. He oversees all wildland fire and land management activities and also has held the positions of Fire Chief and Assistant Director. He began his career with the division as a Forest Ranger and firefighter suppressing wildfires in 1985. He has more 30 years of experience in wildfire and emergency response and land management with the U.S. Forest Service and the Florida Forest Service.

Jim has coordinated the department's Emergency Response Program since 1995 through numerous hurricanes, floods, tornadoes, wildfire outbreaks and other emergencies. He is currently

the president of the National Association of State Foresters, representing all 50 states on wildland fire issues. He also represents all states on the Wildland Fire Executive Council with the U.S. Forest Service and Department of Interior. He received his Bachelor of Science in Forest Management from the University of Minnesota.



Tom Harbour's first experience with wildfire was firefighting in central California in 1970. Since then, Tom has been involved in wildland Fire and Aviation Management his entire career. Beginning as a firefighter, Tom has had opportunities to fight, prescribe, and manage fires across the United States and internationally. His emergency management experiences have included fires, hurricanes, earthquakes, riots, floods, and other types of disasters all across America. His prescribed fire experience includes opportunities across the United States. He has been a Burn Boss, an Incident Commander, and Area Commander at the highest levels of complexity. He has a Bachelor of Science degree in civil engineering from the University of California Davis and a Bachelor of Science degree in forest management from Washington State University. He graduated summa cum laude from the University of California at Davis and with Presidential Honors for a 4.0 GPA from Washington State University. He has done post-graduate work at the JFK School of Government, Harvard University and the Kenan-Flagler School of Business at the University of North Carolina. He served with faculty and leaders at the Marine Corps University, Quantico, Virginia. The US Forest Service Fire and Aviation Management program employs over 10,000 firefighters and has a budget over $2 billion (US). He has been happily married for over 35 years, and is a proud Father and Grandfather.

Dick Bahr works in the Department of the Interior, Office of Wildland Fire where he is the Deputy Director, Management and Programs. He coordinates the fuels, preparedness, response, emergency operations and wildland fire information technologies programs providing guidance, policy and oversight of the Interior Bureaus (Bureau of Indian Affairs, Bureau of Land Management, US Fish & Wildlife Service, and National Park Service) implementation of wildland fire. Prior to this he had made a career working with the National Park Service beginning in Glacier National Park as a microbiologist monitoring water and wastewater quality in 1977. He made the move into Fire Management in 1981 as a Fire Control Aide doing structural fire, fire and life safety inspections, and wildfire control. In 1984 he chose wildland fire as a career path and accepted a permanent position as fire cache manager in Everglades National Park. In 1987 he was westward bound to Yellowstone National Park working there in wildland fire and aviation until 1997. He then went to the Midwest-Regional Office as the Prescribed Fire Specialist building a program that treated over 30,000 acres a year. In the summer of 1999 he headed to the Fire Management Program Center in Boise as the Fire Use Specialist overseeing the fuels and wildland fire use program at the National level. Dick stepped up to the NPS Fire Science and Ecology program lead job in 2005. In 2014 he took his present position with the DOI, Office of Wildland Fire.

Alan Goodwin is the Chief Fire Officer, a role he has held since October 2012. Previously, Alan was the Regional Director for the North West region of the former Department of Sustainability and Environment. Alan has 20 years' experience working in the forest and fire industry, including roles with Forestry Tasmania. Alan's previous roles for the Victorian Government also include Assistant Chief Fire Officer and Director Planned bunting. He has been involved in several wildfire response deployments from Australia to the United States. In 2008 / 2009 Alan and his family spent 12 months living in the United States spending time at the National Interagency Fire Center in Boise, Idaho and the Office of Wildland Fire at the US Department of Interior, Washington DC. In addition to being on the IAWF Board of Directors he is a fellow of the Australian Rural Leadership Foundation and received the Australia Fire Service Medal in 2012.

Marc Castellnou Ribau, Forest Area Chief (GRAF). Strategical Fire Analyst, Catalan Fire Service Marc Castellnou is a fireman with over 25 fire seasons and over 60 large fires in Spain, France, Greece, Scotland and USA. He has extended experience in incident strategy, operation commandment and forest fire management. He introduced the concept of fire analysis in Europe, and has developped it extensively. Marc is the Forest Area Chief inside the Catalan Fire Service, where he introduced the Prescribed Burning Program. He promoted a lessons learned culture, and a shift towards fire management and strategical decision-making in forest fires.Marc has been working in fire management projects all over Europe.Marc is founder and Chairman of Pau Costa Foundation, a platform on forest fire management, as well as an instrument to divulgate and investigate in fire ecology.

PLENARY PANEL SESSION

THE CHANGING FACE OF INCIDENT MANAGEMENT

MODERATOR: Larry Sutton, Risk Management Officer, US Forest Service

PANELISTS:

- **Robert R. Maynes,** Deputy Assistant Chief Retired, Fire Department City of New York, Queens Borough Commander, FDNY IMT Incident Commander
- **Jim Manahan,** Former Assistant Chief of Operations, FDNY and current FEMA, IMT IC (NYRegion)
- **Pruett Small,** Training Officer, Groom Creek Fire District, Prescott, Arizona

Robert Maynes recently retired from the FDNY Staff as The Queens Borough Commander and was in this position during super Storm Sandy. In this capacity he was responsible for operations, policy, training and administration for the 96 units assigned to the Borough of Queens. As a Staff Chief he served as citywide Incident Commander on a rotating schedule. He also served as a collateral assignment as Incident Commander on the FDNY Incident Management Team. He had been in this position since 2008 after serving five years as The Operations Section Chief. Additionally he possesses national qualifications as an Type-II Incident Commander, Type-I Operations Section Chief, Liaison Officer, and Type-II Safety Officer. He served for two years on a National Type-One Incident Management Team based in the Southwest. Maynes has deployed nationally to 15 incidents including the FDNY IMT response to New Orleans following Hurricane Katrina. He has thirty-four years of experience as a first responder. Maynes has a BA from Stonybrook University.

Jim Manahan worked for the FDNY for over 35 years, retiring in July 2014. During his time in the Department he has held multiple ranks. Starting as a firefighter In Brooklyn he has held the ranks of Lieutenant, Captain, Battalion Chief, Deputy Chief, Deputy Assistant Chief and Assistant Chief. As an Assistant Chief he was second in command of FDNY Operations. During his last 12 years in the Department Jim has participated in advanced training programs that were the direct result of 9/11. Working on recommendations from the McKinsey Report and the Federal Government Jim assisted in incorporating the National Incident Command System into day to day operations of the Fire Department. He attended National Training programs to further develop his leadership skills and understanding of the National Incident Management System. Jim operated as the FDNY Incident Management Team's Planning Section Chief in New Orleans during the crisis created by hurricane Katrina. He was also the Deputy Incident Commander during the FDNY Incident Management Team deployment to Baton Rouge Louisiana and Broome County New York. During Superstorm Sandy he was deployed for 55 days as the Incident Commander for the IMT. He has lectured in Chicago, Phoenix, New York, San Diego, France, and England on large scale incident management. Jim is currently one the Emergency Manager Specialists at Brookhaven National Laboratory on Long Island, New York.

Pruett Small started his fire service career in 1979 as a wildland firefighter on the Cleveland National Forest in San Diego, California on a type 3 engine company. In 1980 he moved to Prescott, Arizona where he worked three fire seasons on the Prescott Hot Shot crew and three fire seasons on the Prescott Helitack crew. In 1985 he joined the Central Yavapai Fire District where he worked for 26 years and retired as the Training Chief, coordinating a regional training academy. In 2011 Pruett joined the Groom Creek Fire District and works as a training officer. Pruett has attended numerous National Fire Academy courses and is a graduate of Arizona State University's Fire Service Institute. He has an A.A.S. degree in Fire Science and a Bachelor's degree in Fire Service Management. He has been a member of Type 1 and 2 incident management teams for the past 20 years and is qualified as a type 1 Incident Commander and as a type 1 Operations Section Chief. He has performed on over 85 Type 1 and 2 incidents. He travels nationally and internationally teaching ICS and All-Hazard incident management team courses and develops and conducts incident management team simulations/exercises. Pruett has been married to Karen for 32 years and they live in Prescott, Arizona.

CLOSING PRESENTATION

THE DOCTRINAL ROAD TO RISK MANAGEMENT - WHERE WE'VE BEEN, WHERE WE ARE HEADED

Tom Tidwell, Chief, US Forest Service, Washington, DC, USA

Tom Tidwell has spent 33 years in the Forest Service. He has served in a variety of positions at all levels of the agency, including as district ranger, forest supervisor, and legislative affairs specialist in the Washington Office. As deputy regional forester for the Pacific Southwest Region, Tom facilitated collaborative approaches to wildland fire management, roadless area management, and other issues. As regional forester for the Northern Region, Tom strongly supported community-based collaboration in the region, finding solutions based on mutual goals and thereby reducing the number of appeals and lawsuits.

In 2009, after being named Chief, Tom set about implementing the Secretary's vision for America's forests. Under his leadership, the Forest Service is restoring healthy, resilient forest and grassland ecosystems—ecosystems that can sustain all the benefits that Americans get from their wildlands, including plentiful supplies of clean water, abundant habitat for wildlife and fish, renewable supplies of wood and energy, and more.

Such benefits are at risk from the effects of climate change, and Tom has led the way in forging a national response. Under Tom's leadership, the Forest Service has charted a national roadmap for addressing climate change through adaptation and mitigation. The Forest Service is taking steps to help ecosystems adapt to the effects of a changing climate while also taking action to mitigate climate change, partly by reducing greenhouse gas emissions.

Tom has facilitated an all-lands approach to addressing the challenges facing America's forests and grasslands, including the overarching challenge of climate change. Such challenges cross borders and boundaries; no single entity can meet them alone. Under Tom's leadership, the Forest Service is working with states, Tribes, private landowners, and other partners for landscape-scale conservation—to restore ecosystems on a landscape scale.

FIRESCIENCE.GOV
Research Supporting Sound Decisions

Funding wildland fire research and distributing results to support sound policy and management decisions

Your Program at work - recently completed research includes

- *Firefighter Safety Zones: Review of Past Science & Summary of Future Needs*
- *Characterizing the Effect of Terrain Slope on Firefighter Safety Zone*
- *Public Perceptions of Smoke and Agency Communication*
- *A Synthesis of Research Perspectives on the Public and Fire Management*
- *Advancing Knowledge about Citizen—Agency Trust: A Collaborative Assessment Framework for the U.S., Australia, and Canada*

Fire Science Exchange Network — Accelerating awareness, understanding, and adoption of wildland fire science information

Connect and learn through

Field Tours
Workshops
Conferences
Webinars
Syntheses
Fact Sheets
Newsletters
Social Media

International Association of Wildland Fire

Managing Fire, Understanding Ourselves: Human Dimensions in Safety and Wildland Fire

13th International Wildland Fire Safety Summit & 4th Human Dimensions of Wildland Fire Conference

Boise Centre, Boise, Idaho, USA

April 20-24, 2015

PROGRAM SCHEDULE

Monday, April 20, 2015

7:00 am-8:00 pm	**Conference Registration/Information Desk Open - *Meadow (Boise Centre Foyer)***					
	WORKSHOPS					
	Willows	**Pines**	**Firs**	**Cottonwoods**	**Salmon River**	**Snake River**
8:30 - 12:30	Assessing Residential Wildfire Hazards *Instructor: Pat Durland*	The Fire that Burns Within: Fire Service Suicide – The Reality *Instructor: Mary VanHaute*	Building Capacity to Collaborate in Natural Resources Management *Instructors: Susie Kocher, Kim Ingram*	Annual Fire Refresher – RT-130 *Joel Welch-Lead Instructor, Mike Elles-Unit Lead, Matt Ziegler-Unit Lead, Rob Smolczynski-Unit Lead, Tim Garity- Unit Lead, Jeremy Schwandt- Unit Lead*	Improving Risk Assessment through Fire Behavior Analysis *Instructors: Dan Mindar, Erin Noonan-Wright, Tami Parkinson, Laurie Kurth*	Wildland Fire Smoke Health Effects Research and Tools to Inform Public Health Policy and Recommendations *Instructors: Ana Rappold, Susan Stone, Pete Lahm, Wayne Cascio, Sarah Henderson, Angela Jiayun Yao, Catherine Elliott, Joseph Domitrovich, Ian Gilmour, Brian Reich, Sim Larkin, Susan O'Neill, Paul Garbe*
12:30-1:30 PM	**Lunch - on your own**					
	WORKSHOPS (cont.)					
	Willows	**Pines**	**Firs**	**Cottonwoods**	**Salmon River**	**Merlins**	**Snake River**
1:30 - 5:30 PM	(continued…) Assessing Residential Wildfire Hazards	(continued…) The Fire that Burns Within: Fire Service Suicide – The Reality	(continued…) Building Capacity to Collaborate in Natural Resources Management	(continued…) Annual Fire Refresher – RT-130	US National Grid (USNG) and Wildland Fire *Instructors: Rich McCrea, Al Studt*	Competency in Crisis *Instructor: Christophe FRERSON*	Stress First Aid for Firefighters and Emergency Medical Services Personnel *Instructors: Kim Lightley, Dr. Patricia Watson*
5:00-8:00 PM	**Vendor Set up *(Eagle - Boise Centre)***						
7:00 pm	**After Hours Networking** - 10 Barrel Brewing Company, 826 W Bannock Street						

Tuesday, April 21, 2015

7:30 am-5:00 pm	**Conference Registration/Information Desk Open - *Meadow (Boise Centre Foyer)***
8:30-9:00	**OPENING REMARKS AND WELCOME - *Peregrines*** *Tom Zimmerman, IAWF President and Conference Co-Chair* **Presentation of Colors**: *Boise Firefighters Pipes and Drums & Boise Fire Department Honor Guard*
9:00 - 10:00	**GENERAL SESSION - *Peregrines*** **Disaster, Devastation, Resilience and Recovery: The Journey of Strathewen Primary School** ***Jane Hayward,*** *Principal, Strathewen Primary School, Victoria, Australia*
10:00 - 10:30	**NETWORKING BREAK with Exhibitors - *Eagle***

	CONCURRENT SESSIONS				
	Willows	**Pines**	**Firs**	**Cottonwoods**	**Merlins**
	Measurement and Fire *Moderator: Toddi Steelman*	***Risk*** *Moderator: Anne-Lise Velez*	***New Development in Wildland Firefighting*** *Moderator: Lily Konantz*	***Fire Adapted Communities*** *Moderator: Adam Gossell*	***People, Climate and Landscapes*** *Moderator: Cassandra Moseley*
10:30-10:40	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions
10:40-11:00	1. Do we have an acceptable loss in Wildland Fire? *Ivan Pupulidy*	4. Wildfire risk management in Europe: the challenge of seeing the "forest" and not the "trees" *Fantina Tedim*	8. Changing cultures/attitudes in aerial firefighting - Pre determined dispatch of aircraft *Wayne Rigg*	12. Measuring Community Adaptive Capacity and Wildfire Risk in the American West: Coupling Results from Key Informant Surveys and Biophysical Risk Analysis *Max Nielsen-Pincus*	16. Investigating the Impacts of Surface Temperature Anomalies Due to Wildfires in Northern Sub-Saharan Africa *Trisha Gabbert*
11:00-11:20	2. Network Management and Performance on Complex Fire Events *Branda Nowell*	5. Localized Risk Perception on Wildfire Hazard *Voravee Chakreeyarat*	9. Fire and Aviation Management Enterprise Geospatial Portal *Jill Kuenzi*	13. Creating a Culture of Adaptation: A Learning Network Approach to Fire Adapted Communities *Michelle Medley-Daniel*	17. How society and climate will combine to affect wildfire in the U.S. South, 2015-2060 *Jeffrey Prestemon*
11:20-11:40	3. Towards metrics of success in residential preparedness for wildfire *James Absher*	6. Fire and Fuel Management in Banff National Park; Balancing Risk and Sustainability *Robert Osiowy*	10. Military Veterans in the Wildland Fire Service – Issues, Obstacles, and Benefits *Alexis Lewis Waldron*	14. Enhancing Community Response - Utilising existing information networks during bushfires *Kathy Overton*	18. Spatial Pattern of Fire With Respect to Human Settlements in a Tropical Dry Forest Landscape *Narendran Kodandapani*
11:40-12:00	Q&A	7. Risk - Risk Tradeoffs in Wildfire Management – The Ranch Fire Case Study *David Calkin*	11. Organizational response to incidents and accidents *Ivan Pupulidy*	15. You Mean It might Burn? Embarking on Austin's Journey to Become Fire Adapted *William Conrad*	Q&A
12:00-1:30	**Lunch (On your own)**				
	CONCURRENT SESSIONS				
	Willows	**Pines**	**Firs**	**Cottonwoods**	**Merlins**
	Special Session One: Indigenous People and Wildland Fire *Moderator: Amy Christianson*	***Risk*** *Moderator: Hannah Brenkert-Smith*	***Management and Goverance of Wildfire*** *Moderator: Vita Wright*	***Collaborative Approaches*** *Moderator: Tony Jarrett*	***Different Ways of Understanding Fire*** *Moderator: Gene Rogers*
1:30-1:40	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions
1:40-2:00	19. Wildfire evacuation experiences of a First Nations community in Alberta, Canada *Tara McGee*	23. Inducing Private Wildfire Risk Mitigation: Experimental Investigation of Measures on Adjacent Public Lands *Joseph Little*	28. Wildland Fire Governance: Strategies of Effective Suppression Firms *Cassandra Moseley*	33. Building Capacity for Wildfire Mitigation Through Collaborative Partnerships *Jerry McAdams/Julia Kertz-Grant/Jennifer Tomlinson*	38. Radio Technology Opportunities and Constraints: Using Dramaturgy as an Analytic Tool *Jennifer Ziegler*
2:00-2:20	20. In their words: how a wildfire evacuation affected residents of a Northern Alberta First Nation community *Kyla Mottershead*	24. Mitigation Behavior to Reduce Wildfire Risk: What Motivates Homeowners to Mitigate Wildfire Risk? *Hari Katuwal/ Tyron Venn*	29. Fire Manager or Market Manager? Administrative Practices for Large Fire Suppression *R. Patrick Bixler*	34. Increasing Capacity for Collaboration by Training Natural Resource Management Agencies, Scientists and Stakeholders *Susie Kocher*	39. The Storyteller's Role In Accident Investigations ~ Naturalistic Learning From Unintended Outcomes *Steve Holdsambeck*
2:20-2:40	21. Using Historical Photographs to Identify Indigenous Burning Patterns *Rick Arthur*	25. Is the whole greater than the sum of its parts? Homeowner wildfire risk mitigation and community heterogeneity *Hannah Brenkert-Smith*	30. The Influence of Incident Management Teams on Suppression Resource Use *Michael Hand*	35. Collaborative Implementation for Ecological Restoration on US Public Lands: Implications for Legal Context, Accountability and Adaptive Management *Sarah McCaffrey*	40. Australian volunteer rural fire brigades: the value of historical perspective *Sandra Lauer*
2:40-3:00	22. Māori use of fire: traditional use of fire to guide wildfire management in New Zealand *E.R. (Lisa) Langer*	26. Potential for Disseminating SAWTI Risk Information: Understanding Information Seeking and Wildfire Preparedness in Southern California *Anne-Lise Velez*	31. Social "Watch Out" Situations for Incident Management Teams *Toddi Steelman*	36. Fires of Change: An Art and Science Collaborative *Andrea Thode*	41. Making Every Word Count: Teaching Wildland Fire in the Brazilian Amazon *Matthew Carroll*
3:00-3:20	Q&A	27. LiDAR based risk assessment in the WUI: An analysis of pre-fire conditiosn of the Black Forest Fire *Andrew Karlson*	32. What Cohesive Strategy Looks Like on the Ground *Katie Lighthall/Steven Hawkins*	37. Local perceptions of forest management and wildfire risk in Northeast Oregon *Angela Boag*	42. Optimal forest management: A dynmanic analysis to promote healthy forests and economic development *Kara Walter*

3:20-3:50	**NETWORKING BREAK with Exhibitors - *Eagle***				
3:50-4:50	**GENERAL SESSION - *Peregrines*** **Wildfire Policy as a Socio-ecological Problem** *Toddi Steelman, Executive Director and Professor, School of Environment and Sustainability, University of Saskatchewan*				
5:00-7:00 PM	**Social Reception with Exhibitors - *Eagle***				
Wednesday, April 22, 2015					
7:30 am-5:00 pm	**Conference Registration/Information Desk Open - *Meadow (Boise Centre Foyer)***				
8:00-8:15	**WELCOME BACK AND DAILY ANNOUNCEMENTS *(Peregrines)*** *Larry Sutton, US Forest Service, Conference Co-Chair*				
8:15-9:45	**GENERAL SESSION** **Global Wildland Fire Perspectives Panel Session: Agency Perspectives of Firefighter Safety and Human Dimensions in Wildland Fire Management and the Emerging Importance of this Area** Facilitator: **Marjie Brown,** *Consultant, ScienceFire Communications, Inc* ***Jim Karels,*** *President, National Association of State Foresters (NASF) and State Forester, Florida, USA;* ***Tom Harbour****, USFS Director of Fire and Aviation Management, USA;* ***Dick Bahr,*** *Deputy Director Management & Programs, DOI, Office of Wildland Fire, USA;* ***Alan Goodwin****, Chief Fire Officer, Department of Environment, Land, Water and Planning, Victoria, Australia;* ***Marc Castellnou,*** *Fire Manager, Catalan Fire Service, President of Pau Costa Foundation, Spain*				
9:45-10:15	**NETWORKING BREAK with Exhbitors - *Eagle***				
	CONCURRENT SESSIONS				
	Willows	**Pines**	**Firs**	**Cottonwoods**	**Merlins**
	Models and Methods for Safety *Moderator: Chuck Bushey*	***Decision Making and Fire*** *Moderator: Rebekah Fox*	***Evacuation and Sheltering*** *Moderator: Tony Jarrett*	***People, Climate and Landscapes*** *Moderator: Alen Slijepcevic*	***Fire Adapted Communities*** *Moderator: Toddi Steelman*
10:15-10:20	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions
10:20-10:40	43. Suppression of forest fires by the drop water flows interspaced in time and space *Pavel Strizhak*	47. The Protective Action Decison Model: It's Application in an Australian Bushfire Context *Ken Strahan*	51. Do I stay or do I go? The role of risk tolerance in evacuation decisions during a wildfire event *Sarah McCaffrey*	54. Spatial allocation of landscape values *Jose Sanchez*	58. Developing fire adapted communities: The importance of interactions among elements of place-dependent local context *Travis Paveglio*
10:40-11:00	44. A Proposed Experimental Methodology for Assessing the Effects of Water and Dry Matter Content on Live Fuel Flammability *Oleg Melnik*	48. Connecting Science and Decision-Making in Wildland Fire Management *Melanie Colavito*	52. Sheltering practices during bushfires: lessons from the 2009 Black Saturday fires *Joshua Whittaker*	55. People's Perceptions of Post-Wildfire Landscape Recovery *Chad Kooistra*	59. Reducing Structural Losses from Wildfire: Are Regulations the Answer? *Cheryl Renner*
11:20-11:40	45. Interacting with Wildfire Simulations and Historical Wildfire Analysis *James Gattiker*	49. Power and Decision Making: A Foucaultian Analysis of Wildland Decision Making *Van Miller*	53. Establishing wildfire evacuation zones—a coupled human-environment system approach *Dapeng Li*	56. Lessons from a Legacy of Wilderness Fire: Benefits, Challenges, and Tools for Success *Vita Wright*	60. Wildfire policy after structure loss: how does regulation alter rebuilding and residential growth after wildfires? *Miranda Mockrin*
11:40-12:00	46. Wildland Firefighter Safety and Fire Behavior Prediction in the Field *Martin Alexander*	50. Nudging Wildfire Managers – Taking Advantage of Behavioral Economics in Decision Support and Performance Management *David Calkin*	Q&A	57. How effective is wildfire communication to New Zealand communities and how can it be improved? *E.R. (Lisa) Langer*	61. Fire Adapted Communities in the Real World: Community Perspectives on What Actions and Processes Are Needed for Diverse Communities to Become More Resilient to Wildfire *Sarah McCaffrey*
12:00-1:30	**LUNCHEON - *Hawk*** *Featuring: Wildland Fire Safety Award Presentation* *Presentations by National Fallen Firefighter Foundation; Wildland Firefighter Foundation and International Fire Relief Mission* *IAWF Annual Membership Meeting*				
1:30 -2:30	**POSTER SESSION *(Meadow - Boise Centre Foyer)***				

POSTER PRESENTATIONS

P1. Forest Fire Safety Handbook: updating training literature for the Spanish spoken community, *Presenter: Raul Quilez*

P2. Interactive 911 Program
Presenter: Sandra Inman-Carpenter

P3. The Role of Departments of Transportation in Wildfire Response
Presenter: Wesley Kumfer

P4. Gender and Leadership in Wildfire Suppression: Women Leaders on the Fireline,
Presenter: Rachel Reimer

P5. The Sounds of Wildland Firefighting in Action: Communication Research Study
Presenter: Elena Gabor

P6. Social "Watch Out" Situations for Incident Management Teams
Presenter: Toddi Steelman

P7. Australian volunteer rural fire brigades: the value of historical perspective, *Presenter: Sandra Lauer*

P8. Fire Adapted Communities Learning Network, *Presenter: Michelle Medley-Daniel*

P9. Knowledge for Wildfire; improving management of UK wildfire through knowledge exchange
Presenter: Julia McMorrow

P10. Student of Fire: Local actions to support global issues,
Presenter: Kelsey Gibos

P11. The Incident Risk Console (RisC) – A Risk Assessment Synopsis for Wildland Fires,
Presenter: Lisa Elenz

P12. Fire in Southern Ecosystems
Presenter: Adam Kent

P13. What We Talk About When We Talk About Fire: Words, Media, and Wildfire
Presenter: Alexandra Weill

P14. Big questions, local answers: Awareness and preparedness of unprepared people in Idaho
Presenter: Elise Thiel

P15. Collaborative Landscape and Community-Level Wildland Fire Management Planning and Implementation within the Resort Municipality of Whistler, British Columbia, Canada, *Presenter: Nicholas Soverel*

P16. Bringing the Fire Adapted Message to Ada County, *Presenter: Jerry McAdams*

P17. Ranching with Fire: Livelihoods, Resiliency and Adaptive Capacity of Rural Idaho, *Presenter: Kyle McCormick*

P18. Enhancing Community Response-Utilising existing information networks during bushfires, *Presenter: Kathy Overton*

P19. Fires of Change: An Art and Science Collaborative, *Presenter: Andrea Thode*

P20. We all play a part- Bushfire Ready Neighbourhoods, *Presenter: Peter Middleton*

P21. Boulder County Wildfire Partners- Home Ignition Zone, Education, Certificates, Case Studies, and iPads
Presenter: Ryan Ludlow

P22. First Nations Wildfire Evacuation Partnership
Presenter: Tara McGee/Amy Christianson

P23. INSIGHT + ACTION = RESILIENCE Proven Results from Wollombi Australia
Presenter: Glenn O'Rourke

P24. Assessment of the Barriers to Wildland Firefighters' Fitness Training
Presenter: Aria Mangan

P25. Polycyclic Aromatic Hydrocarbon Exposure from Prescribed Fire
Presenter: Kathleen Navarro

P26. Impact of a Flame Resistant Synthetic Material Base Layer on Heat Stress
Presenter: Matthew Dorton

P27. Preliminary evaluation of factors affecting inhalation exposures among wildland firefighters
Presenter: Tim Reinhardt

P28. Rethinking the Fire Shelter
Presenter: Vincent Homer

P29. Fire and Debris Flows at the Boise Front,
Presenter: Katherine T Gibble

P30. Modeling Potential Fire Behavior Changes Due to Fuel Breaks in the Monterey Ranger District, Los Padres National Forest, California
Presenter: Stacy Drury

P31. Fuel Treatment Research and Technology Transfer – How to Better Support Practitioners' Needs
Presenter: Thomas Zimmerman

	CONCURRENT SESSIONS				
	Willows	**Pines**	**Firs**	**Cotton Woods**	**Merlins**
	Health *Moderator: Alan Goodwin*	***Special Session Two:*** ***Wildfire management in coupled human and natural systems: integrating biophysical and socioeconomic information***	***Special Session Three:*** ***Rethinking Awareness, between firefighter safety and safety strategy***	***Leadership*** *Moderator: Jennifer Ziegler*	***Resilient Responses*** *Moderator: Rebekah Fox*
2:30-2:35	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions
2:35-2:55	62. Preliminary evaluation of factors affecting inhalation exposures among wildland firefighters *Tim Reinhardt*	68. A conceptual framework for coupling the biophysical and social dimensions of wildfire to improve fireshed planning and risk mitigation *Jeffrey D. Kline*	73. Rethinking Awareness, between firefighter safety and safety strategy *Marc Castellnou & Al Beaver*	74. Resonant Relational Leadership *David Christenson*	80. Building agency and community capacity for successful engagement – lessons learned from agency programs in Victoria, Australia *Tamara Beckett/Owen Gooding*
2:55-3:15	63. Adaptation of physical training and task performance to wildland firefighting in Spain. Improving firefighters wellness, capabilities and safety *Elena Hernandez*	69. The dynamics of fire-prone coupled human and natural systems (CHANS) and the emergence of wicked problems *Patrick Bourgeron*		75. Transfer of Knowledge, Skills, and Abilities from Leadership Development Training *Michael DeGrosky*	81. Climate Wise Communities: enhancing traditional wildfire risk management using a community multi-hazard resilience program in Sydney, Australia *Jennie Cramp*
3:15-3:35	64. A Review of Wildland Fire Smoke Exposure and Its Health Effects on Wildland Firefighters and the Public *Olorunfemi Adetona*	70. Impacts, trade-offs, and cross-scale connections between wildfire and ecosystem services in the Colorado Front Range *Jelena Vukomanovic*		76. The relationship of mindfulness and self-compassion to desired wildland fire leadership *Alexis Lewis Waldron*	82. Wildfire Resilience: The Development and Validation of the Bushfire Psychological Preparedness Scale (BPPS) *Jessica Boylan*
3:35-4:05	**NETWORKING BREAK with Exhbitors - *Eagle***				
4:05-4:10	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions
4:10-4:30	65. Assessment of the Barriers to Wildland Firefighters' Fitness Training *Aria Mangan*	71. Linking Forest Management and Fire Hazard Conditions in the Eastern Cascades Ecoregion *Susan Charnley*	*Movie about Horta St. Joan accident in 2009. The movie will comunicate the complexity of the decisions made and the uncertainty faced by all the firefighters.*	77. Stockholm vs Woodstock: Risks Associated with Leadership *Bill Arsenault*	83. Increasing Community Resiliency by Promoting the Use of Prescribed Fire in the Southeastern United States: The Fire in Southern Ecosystems Program *Adam Kent*
4:30-4:50	66. An Alternative Way to Estimate Wildfire Smoke Health Costs? A Case Study of a Southwestern US "Mega-Fire" using the Benefits Mapping and Analysis Program – Community Edition (BenMAP-CE) *Benjamin Jones*	72. Predicting WUI homeowners' fire risk mitigation behavior under different landscape management and climate scenarios *Christine Olsen*		78. Leadership, Accountability, Courage and Knowledge *Victor Stagnaro*	84. INSIGHT + ACTION = RESILIENCE Proven Results from Wollombi Australia *Glenn O'Rourke*
4:50-5:10	67. Impact of Flame Resistant Synthetic Material Base Layer on Heat Stress Factors *Matthew Dorton*	Discussion and Q&A		79. Practicing as a Student of Fire: Local actions to support global issues *Kelsy Gibos*	85. Listening for Resilience: Expert Fire Managers Share Crucial Experience *Rebekah Fox*
5:15-6:30 PM	**Social Reception - *Eagle***				
6:30-7:30 PM	**HOSTED WORKSHOP - *Merlins*** **COP's, Cowboys and Geeks – A Round-up for Realtime Wildfire SA** Sponsored by Intterra and Sierra Nevada Corporation *Sign up at the Intterra Booth to reserve your space!*				

Thursday, April 23, 2015

7:30 am-5:00 pm	**Conference Registration/Information Desk Open - *Meadow (Boise Centre Foyer)***				
8:00-8:30	**Coffee with the IAWF Board of Directors - *Meadow***				
	CONCURRENT SESSIONS				
	Willows	**Pines**	**Firs**	**Cottonwoods**	**Merlins**
	Special Session Four: Comprehensive Wellbeing and Resiliency	***Special Session Five: Competency in Crisis***	***Special Session Six: Keeping Fire on the Mountain*** *Moderators: Henry Bastian, Laurie Kurth, Frankie Romero*	***Assessing and Mitigating Firefighter Risk*** *Moderator: Albert Simeoni*	***Risk*** *Moderator: Chuck Bushey*
8:30-8:40	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions
8:40-9:00	86. Comprehensive Wellbeing and Resiliency takes each participant on on a personal and introspecitve journey, focusing on the whole person to include physical, mental, emotional and spiritual wellbeing through an interactive and hands-on approach to life. *Bequi Livingston and Michelle Reugebrink*	87. This special session is designed to move participants to a higher level of competency in crisis management by the use of case study, facilitated dialogues and interactive exercises. *Commander Christophe Frerson*	88. How We Decide: Research on fire management decision making and risk *Sarah McCaffrey*	93. Efficient calculations of optimum paths and travel time for firefighters *Joaquin Ramirez*	99. Marrying Strategic and Tactical Risk *Ivan Pupulidy*
9:00-9:20			89. Defining the Risks and Opportunities: An Agency Administrator's Perspective *Chuck Mark*	94. A comprehensive survey of the long-term health of current federal wildland firefighters *Erin Semmens*	100. The Incident Risk Console (RisC) – A Risk Assessment Synopsis for Wildland Fires *Lisa Elenz*
9:20-9:40			90. Making the Tough, but Right Decision: Review of the 2014 Fire Season on the Kaibab National Forest *Art Gonzales*	95. Quantifying Aviation Accident Risk in Wildland Fire Suppression *Crystal Stonesifer*	101. Developing a strategic wildfire risk assessment tool for the UK rural-urban interface *Julia McMorrow*
9:40-10:00			91. Decision Making for Multiple Fires, with Multiple Objectives, Across Multiple Units: A Geographic Area Fire Managers Perspective *Patti Koppenol*	96. Bald Sisters Fire *Brian Bishop*	102. Reducing the Risk of High Intensity Prescribed Fire *Rick Arthur*
10:00-10:20			92. Using wildland fire to protect, maintain, and enhance resources: A National Perspective *Dick Bahr*	97. De Soto Aviation Incident *Danny Bryant*	103. Dutch Creek Mitigation Measures: Successes & Failures *Bill Arsenault*
10:20-10:40			Q&A	98. Human Dimensions in Wildland Fire Management - Perspectives on the Past, Thoughts on the Future *Tom Harbour*	104. Rethinking the Fire Shelter *Vincent Homer*
10:40-11:00	**Networking Break - Eagle**				
	Willows	**Pines**	**Firs**	**Cottonwoods**	**Merlins**
	Special Session Seven: Wildland Firefighter Health and Safety at MTDC	***Mitigation*** *Moderator: Adam Gossell*	***Tragedy, Death and Recovery*** *Moderator: Lily Konantz*	***Firefighter Safety*** *Moderator: Victor Stagnaro*	***Climate/Weather/Fire Extremes*** *Moderator: Tim Brown*
11:00-11:20	105. This special session will give an overview of the projects at MTDC and how they are all interconnected to improve wildland firefighter safety and health. *Joseph Domitrovich, Tony Petrilli and Joe Sol*	106. Too Late When The Wildfire Is At The Mines Gate *Greg Bartlett*	109. Wildland Fire Fighter Deaths in the United States: A Comparison of Existing Surveillance Systems *Corey Butler*	112. Assessing Firefighter Safety Zone Characteristics *Phillip Dennison*	115. Adding to fire fighter safety through modeling of thunderstorm-induced windshifts: A case study with the 30 June 2013 Yarnell Hill Fire *Gary Achtemeier*
11:20-11:40	*Physiological Job Demands and Heat Stress*	107. We all play a part- Bushfire Ready Neighbourhoods *Peter Middleton*	110. Common Denominators on Tragedy Fires - Updated for a New Fire Enviornment *Matthew Holmstrom*	113. LiDAR mapping of firefighter safety zones: A comparison of flame height- and vegetation height-based guidelines *Michael Campbell*	116. Prototype Fire Weather Impact Based Performance Metric *Robyn Heffernan*

11:40-12:00	(cont…) Special Session Seven	108. Impact of federal fuels treatments on community firesheds in the Deschutes National Forest *Cody Evers*	111. Embracing Recovery: Establishing a Chaplaincy Service for the Wildland Fire Community *Matthew Carroll*	114. Evaluation of a Safety Zone Digital Calculator *Joaquin Ramirez*	117. Understanding effects of heat dosage on soils from slash pile burning in a Piñon-Juniper system (Pinus edulis-Juniperous monosperma) *Elyssa Durán*
12:00-1:30	**LUNCH (On your own)**				
1:30-2:30	**GENERAL SESSION - *Peregrines*** **The Changing Face of Incident Management Panel Discussion** Facilitator: **Larry Sutton,** *US Forest Service, Conference Co-Chair* **Robert R. Maynes,** *Deputy Assistant Chief Retired, Fire Department City of New York, Queens Borough Commander, FDNY IMT Incident Commander;* **Jim Manahan,** *Former Assistant Chief of Operations, FDNY and Current FEMA, IMT IC (NYRegion);* **Pruett Small,** *Training Officer, Groom Creek Fire District, Prescott, Arizona*				
2:45-3:00	**Break /Transition to Concurrent Sessions**				
	CONCURRENT SESSIONS				
	Willows	**Pines**	**Firs**	**Cottonwoods**	**Merlins**
	(continued..) **Special Session Seven: Wildland Firefighter Health and Safety at MTDC**	***Mitigation*** *Moderator: Adam Gossell*	***Fuels Management*** *Moderator: Marjie Brown*	***Firefighter Safety*** *Moderator: Victor Stagnaro*	***Climate/Weather/Fire Extremes*** *Moderator: Tim Brown*
3:00-3:05	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions	Announcements and Introductions
3:05-3:25	*Fitness Standards, Nutrition and Hydration* *Fire Shelter Update*	118. Cost-effective fuel treatment planning *Jason Kreitler*	121. Description of Firebrand Generation in a Pine Stand Fire *Albert Simeoni*	124. Yarnell Hill Entrapment: Additional lessons that could be learned *Richard McCrea*	127. Fire Extremes and the Triangle of Climate, Fuels and People (Part 1) *Tamara Wall*
3:25-3:55		119.. Left out from wildfires mitigation: Does university's population think different? *Thomas Wuerzer*	122. Fuel Treatment Research and Technology Transfer – How to Better Support Practitioners' Needs *Tom Zimmerman*	125. Distilling and disseminating new scientific understanding of wildfire fire phenomena and unfolding of large wildfires to prevent wildland firefighter entrapment *Janice Coen*	128. Fire Extremes and the Triangle of Climate, Fuels and People (Part 2) *Tim Brown*
3:55-4:15		120. Boulder County Wildfire Partners-Home Ignition Zone, Education, Certificates, Case Studies, and iPads *Ryan Ludlow*	123. Modeling Potential Fire Behavior Changes Due to Fuel Breaks in the Monterey Ranger District, Los Padres National Forest, California *Stacy Drury*	126. Listening Up, Down, and Around: Sound Studies and Wildland Firefighter Situational Awareness *John Widman*	Q&A
4:15-:4:20	**Break/Transition to General Session**				
4:20-5:20	**GENERAL SESSION - *Peregrines*** **The Doctrinal Road to Risk Management - Where We've Been, Where We Are Headed** **Tom Tidwell**, *US Forest Service Chief*				
5:20-5:30	**Conference Adjournment**				
6:00 -	**After Hours Networking** Proto's Pizzeria Napoletana, 345 South 8th Street *(10% of the proceeds collected throughout the day will be donated to our fundraising efforts)*				
Friday, April 24, 2015					
	Post Conference Tours and Field Trips				
9:00-12:00	**Oregon Trail - 6 Years of Post-Fire Mitigation** *Sponsored by Fire Adapted Community Learning Network (Meet at 9:00 am Boise Centre - Cottonwoods)*				
9:00-11:30	**National Interagency Fire Center** *(Meet at 8:45 am in the Boise Centre Foyer)*				
9:00-12:30	**Boise City Tour and Botanical Gardens** *(Meet at 8:45 am in the Boise Centre Foyer)*				
1:00-3:30	**National Interagency Fire Center** *(Meet at 12:45 am in the Boise Centre Foyer)*				

WORKSHOPS

FULL DAY WORKSHOPS

BUILDING CAPACITY TO COLLABORATE IN NATURAL RESOURCES MANAGEMENT

Instructors: Susie Kocher, Natural Resources Advisor, California Registered Professional Forester #2874, University of California Cooperative Extension – Central Sierra (El Dorado, Amador, Calaveras and Tuolumne Counties) and Kim Ingram, Community Education Specialist, , University of California Cooperative Extension Outreach Specialist for the Sierra Nevada Adaptive Management Project

This workshop is for scientists, public land managers and stakeholders to build their capacity to collaborate in adaptive management. UC Cooperative Extension has developed training modules for all levels of natural resource management staff and stakeholders interested in developing these skills. Using a train the trainer model, we review best practices for, framing collaborative projects, meeting logistics, group dynamics, understanding interactions, dealing with difficult behaviors and reducing conflict. Over 150 staff from federal and state forestry, fire, wildlife and research agencies, local conservation districts, non-profits and irrigation districts affiliated with the Sierra Nevada Adaptive Management Project have attended this workshop in 2013 and 2014 and report that the workshops are timely and relevant addressing collaboration issues with which they are currently dealing.

Bios: Susie Kocher is a county-based academic who conducts outreach, education and applied research for UCCE focusing on forest resilience and wildfire issues, most recently as part of the California Fire Science Consortium. She has coordinated public outreach for the Sierra Nevada Adaptive Management Project (http://snamp.berkeley.edu/) for the past six years.

Kim Ingram is an outreach specialist who has represented the 8 year, 13 million dollar University of California study of fuels reduction projects on Sierra national forests for the last six years including presenting project progress to community groups, hosting science meetings with stakeholders, organizing field trips and communicating through blogs, videos and emails. She led development of the Facilitation Skills for a Collaborative Adaptive Management Process workbook written to help train SNAMP participants available on line at http://snamp.cnr.berkeley.edu/documents/574/.

THE FIRE THAT BURNS WITHIN: FIRE SERVICE SUICIDE – THE REALITY

Instructor: Mary VanHaute, Coordinator/Trainer, St. Petersburg College Center for Public Safety Innovation

There is a growing concern that suicides may be occurring in the fire service at higher levels than in the general population. The Center for Public Safety Innovation at St. Petersburg (FL) College has been grant funded to develop suicide prevention awareness programs to address the issue and reduce the risk of suicide among firefighters. This eight-hour course provides an overview of the suicide issue globally, in the United States, and within the profession. The suicide prevention workshop is broken into five modules that include information about suicidal behaviors and communication, prevention efforts, protocol and policy development, issues revolving stigma and how to care for survivors of suicide loss.

ASSESSING RESIDENTIAL WILDFIRE HAZARDS

Instructor: Pat Durland, NFPA Instructor & Principal, Stone Creek Fire LLC

Assessing Residential Wildfire Hazards is a new and popular NFPA workshop and discussion of the physical science of heat transfer required for structure ignition by wildfires. The session topics evolve to the social science processes and models that facilitate behavior change and lead to successful WUI mitigation action at residential and community levels.

- Provide a summary of the major issues that contribute to wildland/urban fire losses.
- Discuss the science and research of how landscape fires ignite structures.
- Identify the features & mitigation applications of structural ignition zones.
- Examine the social aspects of understanding and applying pre-event mitigation actions.
- Discuss the process of moving from residential to community mitigation successes.

Bio: Pat has 40 years of experience in all phases of wildland fire management. He is nationally recognized for his expertise in modern-day wildfire mitigation methods and training.
He has assisted numerous federal, state and local agencies, non-profit organizations and insurance companies in developing and implementing successful wildfire mitigation programs.
Pat assisted NFPA with the development of this program and instructs it throughout the US.
As a 20-year resident of the Boise foothills, Pat understands WUI wildfire danger both personally and professionally.

ANNUAL FIRE REFRESHER – RT-130

Instructors: Joel Welch-Lead Instructor, Mike Elles-Unit Lead, Matt Ziegler-Unit Lead, Rob Smolczynski-Unit Lead, Tim Garity- Unit Lead, Jeremy Schwandt- Unit Lead

Attendance at an RT-130 is required for designated positions in order to maintain currency, and for all personnel assigned to positions with fireline duties and for any position assigned to the fireline for non-suppression tasks.RT-130 training will focus on mandatory core content subjects and not on a minimum time frame standard (number of training hours).

MORNING WORKSHOPS (8:30-12:30)

IMPROVING RISK ASSESSMENT THROUGH FIRE BEHAVIOR ANALYSIS

Instructors: Dan Mindar, WFM RD&A (DOI NPS), Erin Noonan-Wright, WFM RD&A (USDA FS) Tami Parkinson, WFM RD&A (USDA FS), Laurie Kurth, Applied Fire Ecologist (USDA FS)

The workshop will focus on the interaction between Line Officers (decision makers) and Fire Behavior Specialists, such as Fire Behavior Analysts (FBAN), Long Term Analysts (LTAN) Geospatial Analysts (GSAN), and Technical Specialists (THSP) during wildfire risk assessments. Through short case study presentations and panel discussions we will explore how we can better work together to develop more complete risk assessments and better utilize the tools of science and technology in risk-informed decision-making on wildland fires. We will demonstrate what and how fire behavior information can influence a decision and lead to improved resource management as well as explore opportunities to develop additional information that currently is not available.

Target Audience: Fire Behavior Specialists and Line Officers involved in risk assessments and decision making on wildland fire incidents.

WILDLAND FIRE SMOKE HEALTH EFFECTS RESEARCH AND TOOLS TO INFORM PUBLIC HEALTH POLICY AND RECOMMENDATIONS

Instructors: Ana G. Rappold, Susan Stone, Pete Lahm, Wayne E Cascio, Sarah Henderson, Ph.D., Angela Jiayun Yao, Catherine Elliott, MD, PHPH, Joseph W Domitrovich, Ian Gilmour, Brian Reich, Sim Larkin, Ph.D., Susan O'Neill , Dr. Paul Garbe

Due to a predicted increase in the number and severity of wildfires, new research has focused on identifying the health effects associated with both public and firefighter exposure to wildland fire smoke and spatiotemporal prediction of smoke exposures. In the last several years the Joint Fire Science Program (JFSP) funded research proposals for estimating the health impacts of wildfires and exposures to smoke. The goal of this workshop is to bring together health researchers, including those funded by JFSP, together with federal, state, and local agencies who develop public health policies, as well as the technology by which relevant information can be transferred. In the first part of the workshop we will discuss health research and how it can be used to inform public health policy. The second part of the workshop will focus on guidelines and recommendations to reduce the public health impacts of smoke exposure, and the new tools for forecasting smoke. As a result of the workshop, researchers will gain further insight on the knowledge needed to improve public health practice and related gaps, as well as gain understanding of the latest technologies and how they can be used to transfer useful information.

Bios: Ana G. Rappold, Ph.D. -Dr. Rappold is a Statistician with EPA, Office of Research and Development, Environmental Public Health Division, and the task lead on North Carolina Wildfire Health Study. Dr. Rappold conducts clinical and epidemiological research of health effects from air pollution at EPA. She is the lead author on three studies of impacts of smoke on communities in rural North Carolina and an author of wood smoke controlled human exposure study. Dr Rappold is also a co-investigator of 2014 JFSP grant "Estimating fire smoke related health burden and novel tools to manage impacts on urban populations".

Susan Stone, MPH - Susan Stone is a Senior Environmental Health Scientist with EPA, Ambient Standards Group, Health and Environmental Impacts Division, and is the leader of the team reviewing the national ambient air quality standard for ozone. Ms. Stone is also the Air Quality Index (AQI) team leader, has coauthored many of EPA's public information documents about the AQI, the health effects of criteria pollutants, and the multi-agency document Wildfire: A Guide for Public Health Officials. She is an author of two studies of the health impacts of smoke from a fire in Eastern North Carolina and one wood smoke controlled human exposure study. Susan Stone has an M.S. from the School of Public Health at the University of North Carolina at Chapel Hill.

Pete Lahm - Pete Lahm is an Air Resource Specialist for the USDA Forest Service, Fire and Aviation Management in Washington, DC. Program manager for the Wildland Fire Air Quality Program which addresses smoke from wildfires and prescribed fires. His focus has been national smoke policy, training and development of smoke impact and forecasting tools.

Wayne E Cascio, MD - Dr. Cascio is the Director of the Environmental Public Health Division, EPA and has an adjunct clinical appointment at the UNC School of Medicine in the Department of Medicine, Division of Cardiology. Dr Cascio is board certified by the American Board of Internal Medicine in Internal Medicine and Cardiovascular Diseases. His current research interests include the study of the cardiovascular health effects of air pollution including wildfire smoke for the purpose of informing risk assessment and mitigation strategies; improvement of public health and quality of life through increased environmental health communication and literacy; and decreased environmental risks particularly among vulnerable and high-risk populations.

Sarah Henderson, Ph.D. - Sarah Henderson is an environmental engineer turned environmental epidemiologist. Her research interests lie at any intersection between public health and environmental exposures. Sarah leads the data analyses and study design for a wide variety of projects in Environmental Health Services at the BCCDC. Her current work is related to surveillance modeling, hot weather morbidity and mortality, the health impacts of forest fire smoke, provincial radon exposure, and food safety. Together with colleagues at UBC and the University of Tasmania, she also continues to collaborate on academic projects related to air pollution from forest fire smoke.

Angela Jiayun Yao - Angela Yao completed her master's degree in environmental health at University of British Columbia in 2012 and has been working at the British Columbia Centre for Disease Control since graduation. She has been involved in several studies assessing forest fire smoke exposure and its health effects, as well as the development of public health surveillance system for forest fire smoke exposure. She recently returned to the School of Population and Public Health at UBC to pursue her PhD.

Catherine Elliott, MD, PHPH - Catherine Elliott is a physician epidemiologist with Environmental Health Services at BC Centre for Disease Control and the National Collaborating Centre for Environmental Health since 2008. She earned a Bachelor of Science in Ecology and Environmental Science from McGill University, a medical degree and residency in rural family medicine, as well as a Master's degree in Health Sciences and a fellowship in Public Health and Preventive Medicine (PHPM) at UBC. Recently, Dr. Elliott led an international work group to develop guidelines for public health decision-making during wildfire smoke events. Dr. Elliott's current research at BCCDC/NCEEH includes health effects of air pollution including wildfire smoke, health impact assessment, heavy metals exposures in population subgroups and environmental health surveillance.

Joseph W Domitrovich, Ph.D. - Joe is an exercise physiologist at MTDC and a Pulaski motor. He completed his Ph.D. at the University of Montana, Missoula in Interdisciplinary Studies with an emphasis in exercise physiology. He received his Master's also at the University of Montana, and his Bachelors' at Cal Poly San Luis Obispo. Joe's work at MTDC includes hydration, nutrition, health effects of smoke, heat related illnesses, stress and fitness. Dr Domitrovich is a principal investigator for JFSP funded grant tilted "Wildland Fire Smoke Health Effects on Wildland Firefighters and the Public".

Ian Gilmour, Ph.D. - Ian Gilmour is Chief of the Cardiopulmonary and Immunotoxicology Branch of the U.S EPA's Office of Research and Development in RTP. He received an Honors degree in Microbiology from the University of Glasgow, and a doctorate in Veterinary Science from the University of Bristol in 1988. After post-doctoral work at John Hopkins University and the University of North Carolina he joined the EPA in 1998. He holds adjunct faculty positions with the UNC School of Public Health and the Curriculum in Toxicology, and at NC State Veterinary School. He has published over 80 articles on the composition and toxicity of air pollutant mixtures and their influence on the development of infectious and allergic lung disease. Dr Gilmour is the principal investigator for 2014 JFSP grant titled "The role of composition and particle size on the toxicity of wildfire emissions".

Brian Reich, Ph.D. - Brian Reich is an Associate Professor in the Department of Statistics at North Carolina State University. He obtained his Ph.D. in Biostatistics from the University of Minnesota in 2005. His research focuses on spatiotemporal modeling of complex processes in ecology and atmospheric science, methods for high-dimensional data, and extreme value analysis. He has published over 70 papers on these topics, and in 2013 was awarded the Young Researcher's Award by the American Statistical Association's Section on Statistics and the Environment. Dr Reich is the principal investigator of 2014 JFSP grant "Estimating fire smoke related health burden and novel tools to manage impacts on urban populations"

Sim Larkin, Ph.D. - Sim Larkin is a research scientist and team leader with the U.S. Forest Service's AirFire Team in Seattle, Washington. He works extensively with fire management to transition science into operationally useful decision support systems. He is the original architect and designer of the BlueSky Smoke Modeling Framework which is now used in daily smoke predictions and smoke management tools such as BlueSky Playground.

Susan O'Neill, Ph.D. - Susan O'Neill is a Research Air Quality Engineer with the USDA Forest Service Pacific Northwest Research Station, AirFire Team, and has a Ph.D. from the Laboratory for Atmospheric Research at Washington State University. She is an original developer of the BlueSky smoke modeling framework and research interests extend to all aspects of modeling fire emissions, smoke dispersion and transport, and smoke plume chemistry.

Paul Garbe, DVM, MPH - Paul Garbe is Chief of the Air Pollution and Respiratory Health Branch, National Center for Environmental Health at the Centers for Disease Control and Prevention. He directs CDC's National Asthma Control Program, which supports 23 state health departments for comprehensive asthma control activities. Dr. Garbe leads CDC efforts to assist state health departments with public health response to air pollution exposures, including wildland fire smoke exposures.

AFTERNOON WORKSHOPS (1:30-5:30)

US NATIONAL GRID (USNG) AND WILDLAND FIRE

Instructors: Rich McCrea, IAWF member, Wildfire Magazine Vice-Chair, Owner of LarchFire LLC Wildland Fire Consulting and Al Studt. Communications & Structures Specialist with Florida Task Force 4, Lieutenant with Cape Canaveral Fire Rescue, Cape Canaveral, FL.

This workshop entails basic training on the U.S. National Grid (USNG) with hands on demonstrations of GPS and web tools. USNG provides a nationally consistent language of location that has been optimized for local applications. The USNG expands the utility of topographic, street and other large-scale maps by adding several powerful features: It provides a grid reference system that is seamless across jurisdictional boundaries; it provides the foundation for a universal map index; and it enables user-friendly position referencing on appropriately gridded paper and digital maps, global positioning systems (GPS) receivers, and other map portals.

USNG is easy to learn and use and is interoperable with multiple agencies including the US Military. There are many potential applications of USNG in wildland fire operations including tracking firefighting resources, planning and implementation of daily fire operations, and tracking fire behavior across the landscape. USNG grid coordinates can be quickly articulated over a radio, using an identification that totals 6 numbers — the basic, truncated numbers that define any location to an area 100 meters by 100 meters. The potential uses of USNG will be discussed as well as how this system could be implemented.

Bios: Rich works as a wildland fire management consultant and freelance writer. During his career, he worked 32 years with the Department of Interior in fire management and forestry. Outfitted with a degree in Forestry, he started his career as a seasonal employee with the Forest Service as a forestry technician and member of the Helena Hotshot Crew, then moved on to permanent positions with the Bureau of Indian Affairs as a Forester and Fire Management Officer. Rich has considerable experience working with incident management teams including over 23 years' experience as a qualified fire behavior analyst.

Al is a Certified Fire Protection Specialist and Florida Fire Instructor III that is in his 32nd year of fire service and 12th year of urban search & rescue service with deployments to areas ravaged by Hurricanes Andrew and Katrina. Since 2007, Al has worked on implementation and training of US National Grid on local, state and federal levels and has authored numerous articles. He also edited multiple documents for State of Florida requirements regarding US National Grid use during emergency operations. In 2014, he authored an article related to Yarnell Hill fatalities that recommended use of truncated US National Grid as an expedited means to report position on wildfire scenes.

STRESS FIRST AID FOR FIREFIGHTERS AND EMERGENCY MEDICAL SERVICES PERSONNEL

Instructors: Kim Lightley and Dr. Patricia Watson

Stress First Aid (SFA) is a National Fallen Firefighters Foundation program supporting Firefighter Life Safety Initiative #13, "Firefighters and their families must have access to counseling and psychological support." It is designed to reduce the risk for stress reactions in fire and rescue personnel and to help recognize individuals who are reacting to a wide range of stressors in their work and personal lives and who are in need of interventions. SFA offers a spectrum of one-on-one or group interventions to ensure safety, reduce the risk for more severe stress reactions, and promote recovery. SFA monitors the progress of recovery to ensure return to full function and well-being. The principles of peer teams in the fire service and how they can be organized to promote healing are also discussed.

COMPETENCY IN CRISIS

Instructors: Christophe FRERSON, MSc, Commander, French Fire Service

This workshop is designed to move participants to a higher level of competency in crisis management by the use of case study, facilitated dialogues and interactive exercises. Learners will virtually visit the Southern France Crisis Center and experience a 2014 day of Corsican multiple crises (simultaneous wildfires, evacuations, village fires, main roads blocked and a fire engine rollover accident) through interactive media with some of the French operations leaders. You will see firsthand how they consciously use High Reliability Organizing processes to support competency during this multi-crisis day and learn how to bring the salient parts together to "up your game." Competency in this context is an amalgamation of critical thinking, time pressure decision making, and of course leadership. You will have the opportunity to learn and practice new skills in a safe environment with expert guidance. A library of case studies, in addition to the Corsican crisis, will be available after the special session to demonstrate key learning concepts with Saddleback and Yarnell Hill fatality fires as well as other international incidents.

Bio: Since 2012 **C. FRERSON** works as Civil Protection Advisor in the Ministry of Interior, General Directorate of Civil Protection and Crisis Management, at the Southern Inter-ministry Headquarters. He is responsible for planning and is head of the Zonal Emergency Operation Center. In this position, he covers all kind of risks in 16 counties with 22,000 firefighters and a population of about 9 million citizens. C. FRERSON has presented at several international conferences and has published some papers about crisis management. Christophe FRERSON holds a Master's degree in "RISK and Crisis Management." Since 1998, he has worked as an officer in several Fire Departments in various positions, such as, Battalion Chief, Head of Fire Station, Incident Commander, Air Attack Supervisor, designer and head of Research & Technology for operations. During his posting as head of R&T service, he was maintaining international and university partnerships to focus on, share or disseminate lessons learned.

Wednesday, April 22, 6:30-7:30 pm
Location: Merlins
Sign up at the Intterra table to reserve your space!

COP'S, COWBOYS AND GEEKS – A ROUND-UP FOR REALTIME WILDFIRE SA

Sponsored by Intterra and Sierra Nevada Corporation

Situational Awareness is about personal safety, better decisions, effective resources, and improved efficiency. Come learn how to round-up the necessary parts and players that make Wildfire SA a reality for your organization. From a Common Operating Platform to integrated imagery, the geeks that make the data work and the cowboys (and cowgirls) that are bold enough to try new tech will share what we know about realtime SA.

Attendees will learn about:

- Common Operating Platforms – what are they, how do they work, how to select one.
- Geospatial technology – beyond Google, how do you make maps work hard to answer your questions.
- Remote Sensing – Infrared, aerial, satellites, drones, fuels, what is the latest imagery available.
- Data Interoperability – how to share with one another. Nicely.
- Components of tech-supported SA systems – hardware, bandwidth, AVL/CAD, software, data, users - everything has a planned need.
- Current System Examples – see what is out there and in use today.

This fun and interactive session will not only discuss the above, but teach users that bring their tablets how to use tools, access and share data, make mobile maps, and publish critical map info to the media.

FIELD TRIPS

OREGON TRAIL - 6 YEARS OF POST-FIRE MITIGATION (9:00-12:00)

The tragic fatal Oregon Trail fire on October 25, 2008 has led to numerous wildfire mitigation activities centered around the Oregon Trail area and throughout the city, and has led to numerous cooperative partnerships. This tour will highlight the Oregon Trail fire with video clips and a PowerPoint and will also inform attendees about partnerships built over the last several years as well as mitigation initiatives citywide that have occurred since that time, to include lessons learned.
Field Trip Led by: Jerry McAdams, Julia Grant, Jennifer Tomlinson, Brett Dumas, Josh Renz

FIRE ADAPTED COMMUNITIES LEARNING NETWORK

The Oregon Trails Tour is supported by Promoting Ecosystem Resilience and Fire Adapted Communities Together, a cooperative agreement between The Nature Conservancy, USDA Forest Service and agencies of the Department of the Interior Bureau of Indian Affairs, Bureau of Land Management, National Park Service and U.S. Fish & Wildlife Service through a subaward to the Watershed Research and Training Center.

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To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 1400 Independence Avenue SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

NATIONAL INTERAGENCY FIRE CENTER (9:00-11:30 & 1:00-3:30)

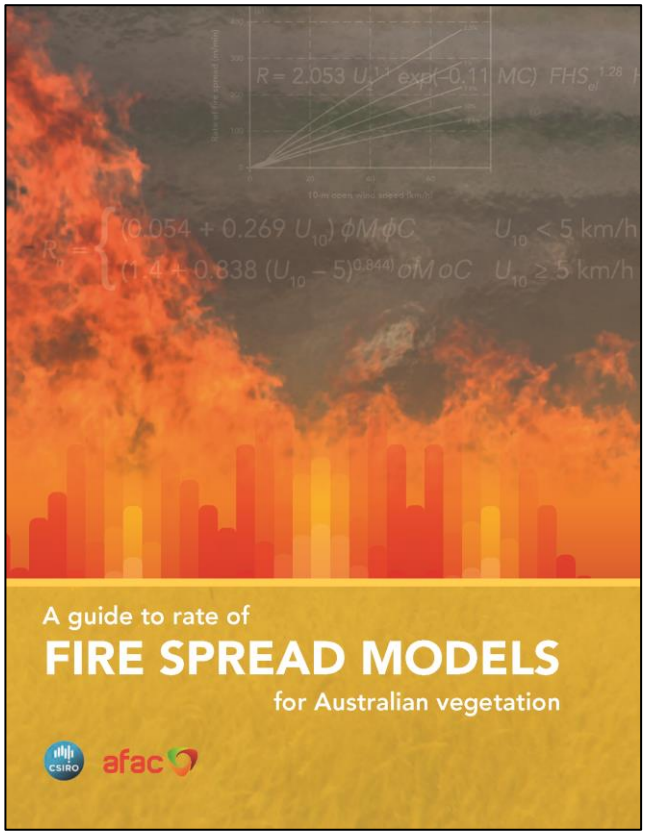
Tour of the National Interagency Fire Center (NIFC), home to national offices of all federal wildland fire management agencies including US Forest Service, Bureau of Land Management, National Park Service, US Fish and Wildlife Service, and Bureau of Indian Affairs; national representatives of the National Association of State Foresters (NASF), United States Fire Administration, Department of Defense, National Weather Service, the National Interagency Coordination Center (NICC), and operational facilities that include a national radio cache, fire engine development center, geographic area equipment cache, smokejumper base, aerial retardant base, and Wildland Firefighter Monument. The tour will specifically provide information on: NICC and an overview of the three tiered dispatch system and four functional coordination areas (equipment, aviation, overhead/crews and predictive services) and a discussion of the National Multi-Agency Coordinating Group (NMAC), overview of eight divisions of the radio cache, a walk-through of the Great Basin equipment cache, an overview of the Smokejumper base and program, an overview of the retardant base, and a walk through of the WFF Monument.

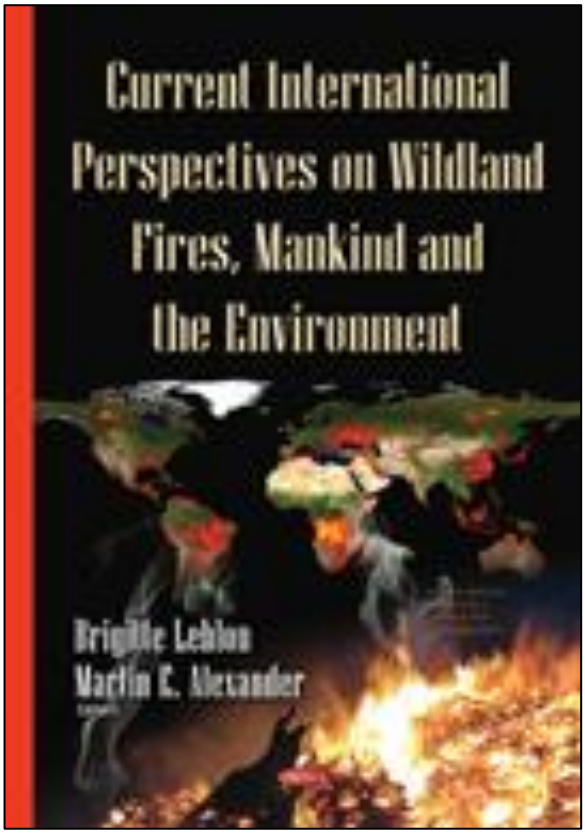
BOISE CITY TOUR AND BOTANICAL GARDENS (9:00-12:30)

This trip will be led by a local guide; guests will visit the following sights in Boise.
The tour will begin and end at the Boise Centre:

- Old Oregon Trail sites
- Downtown Boise
- Boise Basin/Idaho Gold Rush history
- Irrigated Agriculture development
- Idaho Botanical Gardens & Firewise Gardens
- Boise Greenbelt
- Boise Depot
- Old Boise and Warm Springs Avenue
- M-K Nature Center
- Idaho State Capitol
- Boise State University
- Anne Frank Human Rights Memorial

HOT OFF THE PRESS!





Australia Releases New Guide to Predicting Bushfire Rate of Spread
The Australasian Fire and Emergency Service Authorities Council (AFAC) and the Commonwealth Scientific and Industrial Organisation (CSIRO) of Australia have released a new guide to help predict bushfire spread according to Issue 40 (January 2015) of AFAC-news. To order see http://www.afac.com.au/ProductCatalog/Product?ID=1469

Nova Science Publishing Adds to Suite of Wildland Fire Books
This book is the latest contribution dedicated towards the scholarship surrounding the subject of wildland fires to be published by NSP. It consists of a collection of nine chapters covering topics that support the management of wildfires and prescribed fires written by authors based in the northern and southern hemispheres. To order see https://www.novapublishers.com/catalog/index.php

EXHIBITORS

Aviation Specialties Unlimited
www.asu-nvg.com

Since 1994, Aviation Specialties Unlimited (ASU) has been known for launching the FAA's endorsement for the use of night vision technology in civil aviation. The direct beneficiaries of these efforts include EMS, Law Enforcement, and Search and Rescue operations, but also encompass communities across our nation protecting public safety, natural resources, and the welfare of those executing critical missions.

ASU has earned a reputation as a leading innovator in aviation night vision imaging system design, manufacturing, installation, certification, sales, training and service. ASU continues to invest in the development of innovative products and solutions. In 2014, ASU expanded its corporate headquarters and staff to better serve customers around the world who operate in the air, on land, and by sea.

Today's society is demanding smarter technology and a safer environment without compromising quality or efficiency. ASU is accepting that challenge with our continued Innovation for a Safer Tomorrow.

Boise State University
https://www.boisestate.edu/

Boise State University researchers have come together from many disciplines to investigate aspects of natural hazards in southwestern Idaho, in order to better communicate with agencies and policy makers, and prepare our communities and citizens for risks in the future. We conduct research on wildfires, flooding, and related hazards, currently including dust emissions, post-fire debris flows, and the spread of invasive species. Housed in the Departments of Geosciences, Community and Regional Planning and the Public Policy Research Center, professors and students work to cross disciplines in order to establish a meaningful understanding of fire hazards at the wildland urban interface (WUI) and within the Great Basin region, where the threat of climate induced hazards continues to grow and must become more well understood. Our policy researchers are currently seeking to understand wildfire risk perception at the WUI and are conducting a policy network assessment of urban flooding in the Treasure Valley. Our geoscientists work to identify and predict areas prone to fire-related flooding and debris flows, synthesize long-term records of fire and debris flows, and model fuels and resulting burning conditions for the Boise WUI. Our regional planners apply GIS and visualization to analyze and portray wildfire and hazards impact on the landscape. Come to our booth and meet our researchers to learn more about the exciting work currently taking place here at Boise State University!

Bridger Aerospace
http://www.bridgerenterprises.com/aerospace-2/

Bridger Aerospace provides capable, cost-effective, and user friendly intelligence, surveillance, and reconnaissance products and services. Combining a team with years of operational experience with innovative technnology partners, we provide capabilities previously accessible only to those with government or military budgets at a fraction of the cost. From gimbal camera systems and unmanned aerial platforms to full-service ISR flights and custom systems, Bridger Aerospace will work with you to provide the capability you need.

Dragonslayers, Inc
www.dragonslayers.com

Dragonslayers.com does two specific things:
First we consolidated and advanced the traditional wildfire hand tools. They are stronger, wider, longer, more versatile, safer and by far much more effective. These were engineered so that each fire fighter can have their own tool that breaks down and lays flat for mobilization to an incident with their own personal gear. One Universal handle and a Magnum Pulaski, and a Troop Tool weighs 7 lbs. So versatile and responsive is this simple set of tools is that it allows each fire fighter to have a stand upright better angled McLeod scraping tool, an angled shovel for digging and throwing dirt, a better mop-up stand erect tool, a safety staff for negotiating bad ground, and a really better Pulaski that is twice as wide a grub-hoe, balanced, center of mass and longer.

EnviroVision Solutions USA
http://www.evsolutions.biz/

EVS
EnviroVision Solutions

The ForestWatch® early Wildfire Detection and Monitoring System was developed by EnviroVision Solutions (EVS), a South Africa technology firm founded in 2002. Using color image based smoke detection software it provides state of the art situational awareness to fire managers. In 2009 the USA division of EVS was established in Roseburg, Oregon providing service and support for the USA and Canada. EVS has multiple Wildfire Detection and Monitoring Centers around the world including 9 in South Africa covering 4 million acres with 167 towers. The Roseburg, Oregon monitoring center has 30 cameras covering 10 million acres partnering with several wildland fire agencies working together to provide mutual support for early detection of wildfire. Partnering agencies at the Roseburg operations center are the Oregon Department of Forestry, United States Forest Service, Bureau of Land Management, and two local Wildfire Associations, including Douglas Forest Protective Association and Coos Forest Protective Association. In 2013 EVS installed a 42 tower system with one monitoring center in Saskatchewan Canada for the Ministry of Environment. In 2014 EVS USA installed a system in Minnesota for the Department of Natural resources as well as installing the ForestWatch® system at 18 tower sites and 7 monitoring centers in California.

ForestWatch® is a wildfire detection and monitoring system integrating real world data into a powerful decision support and emergency management system that can significantly reduce the time between fire ignition, discovery and dispatch. The ForestWatch® software enables an interface with highly programmable "off the shelf" cameras capable of pan, tilt, and up to 36X optical zoom, in automatic and fully manual modes, providing panoramic color images, Geo-referencing, and smoke detection yielding real time fire intelligence. Night time detection, utilizing near-infrared, provides for 24/7 protection. Camera footage is date and time stamped and archived for investigations and after action reviews. Integrated Geo-referencing pinpoints fire start locations and displays latitude, longitude, distance and bearing on the image, utilizing standard ESRI GIS compatibility. ForestWatch® Online provides web access to near real time and stored images allowing fire mangers to view new fire starts or ongoing incidents.

Fire Science Exchange Network
http://www.firescience.gov/JFSP_exchanges.cfm

FIRESCIENCE.GOV
Research Supporting Sound Decisions

The Joint Fire Science Program's Fire Science Exchange Network is actively working to accelerate the awareness, understanding, and adoption of wildland fire science information by federal, tribal, state, local and private stakeholders within ecologically similar regions. The network of 15 regional exchanges provides timely, accurate, and regionally relevant science-based information to assist with fire management challenges. Regional activities, through which the exchanges engage fire managers, scientists and private landowners, include online newsletters and announcements, social media, regionally-focused web-based clearinghouses of relevant science, field trips and demonstration sites, workshops and conferences, webinars and online training, and syntheses and fact sheets.

The 15 Regional Fire Science Exchanges

Check out your local Fire Science Exchange at the Joint Fire Science Program website – FireScience.gov – to connect with fire managers, practitioners, and scientists in your region.

FRAMES - Fire Research & Management Exchange System

www.frames.gov

FRAMES provides searchable fire-related information, a platform for data sharing and storage, development of new tools, and support to federal wildland fire management agencies in the United States throughout the various stages of wildland fire, including planning, operation, and post-fire monitoring. This online resource was developed for wildland fire managers, researchers, and other stakeholders by the University of Idaho in collaboration with the USFS Rocky Mountain Research Station. FRAMES offers an array of services and features including:

- The Resource Cataloging System (RCS), a searchable online database of data, documents, web pages, tools, projects, and programs. The RCS houses thousands of records and provides access to the Tall Timbers E.V. Komarek Fire Ecology Database
- The FRAMES Emissions and Smoke Portal with educational materials on air quality and smoke management developed by the National Wildfire Coordinating Group's (NWCG) Smoke Committee (SmoC) and the University of Idaho
- Online training for wildland fire managers developed by National Interagency Fuels Technology Transfer (NIFTT) and the National Wildland Fire Coordination Group (NWCG)
- Archived fire videos and webinars from IAWF, the Wildland Fire Lessons Learned Center, and JFSP regional consortia
- Conferences, Meetings, Webinars, Workshops, Training, Announcements, and Job Postings

Grainger

http://www.grainger.com/
@grainger

Grainger with 2013 Sales of 9.4 Billion is North America's leading broad-line supplier of maintenance, repair and operating (MRO) products, with an expanding global presence. Grainger helps customers save time and money by providing the right products and solutions to keep facilities up and running.

International Fire Relief Mission

www.ifrm2007.com

The International Fire Relief Mission is a 501(c)(3) nonprofit corporation that provides humanitarian aid to fire and EMS first responders in developing countries by recycling serviceable fire fighting and EMS equipment. IFRM dispatches teams to the receiving countries to demonstrate and provide the necessary information to safely and effectively use the donated gear. Founded by retired firefighters and medics in 2007, IFRM is propelled by monetary, equipment and in-kind donations from corporate partners and individuals; its field staff is all-volunteer. IFRM maximizes its donors' gifts by operating with a 98% efficiency rating, as measured by the Charity Navigators and the Better Business Bureau. The International Fire Relief Mission is firefighters helping firefighters.

Interagency Joint Fire Science Program

http://www.firescience.gov/
@FireScienceGOV

The Joint Fire Science Program funds scientific research on wildland fire and distributes results to help policymakers, fire managers, and practitioners make sound decisions, by-

- providing credible research tailored to the needs of fire and fuel managers
- engaging and listening to clients and then developing focused, strategic lines of new research responsive to those needs
- soliciting proposals from scientists who compete for funding through a rigorous peer-review process designed to ensure the best projects are funded
- focusing on science delivery when research is completed with a suite of communication tools to ensure that managers are aware of, understand, and can use the information to make sound decisions and implement projects

The Joint Fire Science Program is uniquely positioned to tailor wildland fire research in response to the emerging needs of policymakers and fire managers. An annual cycle of proposal solicitation, review, and funding ensures timely response to evolving conditions. Research projects complement and build on other federal research programs, such as those in the Forest Service Forest and Rangeland Research Stations, U.S. Geological Survey, and National Fire Plan. Synthesis of

research findings and targeted delivery to managers are essential components of the Program.

More than 90 colleges and universities have collaborated on and partnered with JFSP sponsored research projects. By engaging masters and doctoral candidates in these projects, we are training the next generation of resource managers and scientists. This collaboration extends to private, non-profit organizations and tribal, state, county, and local governments as well. In all, nearly 200 organizations have become partners in JFSP-sponsored research.

National Cohesive Wildland Fire Management Strategy

http://www.forestsandrangelands.gov/strategy/index.shtml
@US_Wildfire

The National Cohesive Wildland Fire Management Strategy is a strategic push to work collaboratively among all stakeholders and across all landscapes, using best science, to make meaningful progress towards Resilient Landscapes, Fire Adapted Communities, Safe & Effective Wildfire Response. The result of larger and more destructive fires that have led to increasing costs to lives, natural resources, communities, economies, and fighting fires, Congress called for a Cohesive Strategy in the 2009 FLAME Act. No one agency or organization can act alone to resolve these issues. It is only through "working better together" that we can achieve real change on the landscape level. Through an "all hands, all lands" approach, the Cohesive Strategy is providing the framework for collaborative success towards each of the three tenets above. The vision of 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.

National Fallen Firefighter Foundation

www.FireHero.org

In 2004, The National Fallen Firefighters Foundation held an unprecedented gathering of the fire service leadership occurred when more than 200 individuals assembled in Tampa, Florida to focus on the troubling question of how to prevent line-of-duty deaths and injuries. Every year approximately 100 firefighters lose their lives in the line of duty in the United States; about one every 80 hours. Every identifiable segment of the fire service was represented and participated in the Summit.

The first Firefighter Life Safety Summit marked a significant milestone, because it not only gathered all the segments of the fire service behind a common goal but it also developed the 16 Firefighter Life Safety Initiatives. The summit attendees agreed that the 16 Firefighter Life Safety Initiatives serve as a blueprint to reduce line of duty deaths and injuries. In 2014 a second Life Safety Summit was held and more than 300 fire service leaders gathered. At the second Firefighter Life Safety Summit, the 16 Firefighter Life Safety Initiatives were reaffirmed as being relevant to reduce line of duty deaths and injuries.

16 Firefighter Life Safety Initiatives
1. Cultural change.
2. Accountability.
3. Risk management.
4. Empowerment.
5. Training and certification.
6. Medical and physical fitness.
7. Research agenda.
8. Technology.
9. Fatalities, injuries, and near-miss investigations.
10. Grant support.
11. Response policies.
12. Violent incident response.
13. Behavioral health.
14. Public education.
15. Codes enforcement and sprinklers.
16. Apparatus design and safety.

NFPA Firewise

www.firewise.org

NFPA's Firewise Communities program encourages local solutions and personal responsibility for wildfire safety by involving firefighters, residents, community leaders, planners and others by adopting a long-term, proactive approach to protecting homes from the risk of wildfire. The program provides access to training resources, online learning center, print and audiovisual materials.

NOVELTIS

www.noveltis.com

NOVELTIS is a French private company that was created in 1998. We perform innovative scientific engineering studies and implement customized end-user solutions in the fields of Space, the Environment and Sustainable Development. NOVELTIS' staff have strong expertise in: remote sensing data processing (satellite and aerial data), environmental modelling (fire, weather, vegetation and ocean), geographic information systems and integrated decision support systems.

NOVELTIS focuses its activities on innovation, in close relations with international research laboratories. Our company supplies end-to-end services to governmental bodies and industries, including emergency management stakeholders. We also coordinate and participate in large-scale European and international projects.

NOVELTIS is certified to the ISO 9001(2008) / ISO 14001 (2004) / OHSAS 18001 (2007) standards and has been granted "Confidential-Defence" status by the French Defence Ministry.
Regarding forest fires, NOVELTIS develops and provides innovative operational services supporting tactical firefighting. Our most recent service, TechForFire, offers real-time information concerning:

- The current situation regarding the fire theatre: precise positions of the active fires, burnt areas, position of the involved firefighting forces, and positions of elements of interest;
- The risk forecast for the coming hours: forecasts of the fire propagation and evaluation of the vulnerable areas to be defended.

The service is based on the latest scientific and technical advances in aerial and satellite monitoring as well as real-time fire propagation modelling and risk forecasting.

The TechForFire service is accessible via four means:

- 24/7 secure user-friendly interactive web application requiring no prior software installation.
- Mobile application for Android smartphones and tablets providing the essential functionalities for use in the field where internet access may be intermittent.
- The application can also upload information to the crisis management centre including fire positions, sensitive elements, firefighting actions, in-situ photos and textual observations.
- Cartographic PDF output, providing high-quality topographic maps of the current and future fire situation, suitable for hardcopy output
- GIS layers for use in 3rd party GIS software packages.

The TechForFire service can be customized according to different end-user needs.
For further information please contact us at: contact@noveltis.fr

Phos-Chek (Mobile App Sponsor)

www.phos-chek.com

For over 50 years PHOS-CHeK has provided the world's leading chemical solutions for management of wildland and structural fires. PHOS-CHeK Long-Term Fire Retardants, Class A & B Foams, Gels, and Fuel Gelling Agents are the safest, most effective and environmentally friendly fire chemicals available and are fully qualified by the USDA Forest Service. PHOS-CHeK Fire Retardants are available in powder and liquid form.

MVP-Fx is the "flagship" all-phosphate retardant. This new formulation is highly visible on the fuel and in the air when dropped and is widely used in the airtanker industry. Our 259F is another formulation which is the only fire retardant that is helicopter fixed-tank qualified by the USFS.

PHOS-CHeK has several Class A foam formulations with WD 881 being the premier product. It is highly concentrated providing superior foaming capability for all applications and is the most cost effective product on the market.

We offer two Gels: PHOS-CHeK INSUL-8 and PHOS-CHeK Aquagel-K, These use super absorbant polymer technology to thicken water. Thickened water stays where you put it, even on vertical surfaces, making nearly all of the water used available to stop fire.

Phos-Chek INSUL-8 is a liquid concentrate that can be deployed from ground equipment or aircraft. It can be mixed on demand and makes superior gel at low use rates.

Phos-Chek Aquagel-K is a dry powder that is ideal for batch mixing and is targeted toward aerial application.

Flash 21 is the premier fuel gelling agent used for prescribed burning. Flash 21 is now the product of choice to be used with aerial ignition devices such as Helitorchs, flame throwers, terra-torches and blivet applications.

For our new Home Defense Program, the same long-term fire retardant, without the red dye, is now available in ¾ gallon jugs of concentrate and 5 gallon buckets of ready to use retardant, giving individuals the power to protect their own property and belongings long before a wildfire threat is imminent.

Sierra Nevada Company/Intterra

Sierra Nevada Corporation (SNC) is a world-class prime systems integrator and electronic systems provider known for its rapid, innovative, and agile technology solutions. Fast-growing and widely diversified, SNC is a high-tech electronics, engineering, and manufacturing corporation that continues to expand our impressive portfolio of capabilities, programs, products and services.

Intterra has developed tools to support work end-to-end. From risk mitigation, pre-planning, and citizen education, to incident management, performance metrics, and public information management, Intterra provides comprehensive tools for your needs. Intterra's SituationAnalyst loads the data you need with analytical tools so you have easily useable real-time data when and where you need it. Integrated tactical mapping and the optional Data Collector App give you additional data in the field and Command Center simultaneously.

Together, SNC & Intterra have designed a program to greatly improve firefighter safety & efficiency through the use of the Colorado Wildfire Management System which incorporates the PC-12 and Intterra's SituationAnalyst software tool. Currently in use in Colorado, the Colorado Wildfire Management System is an ideal solution to support the State's firefighting efforts because it is affordable, fast, can remain airborne for long periods of time, & can be operated from almost any airfield.

SimTable
www.simtable.com
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Add @simtable

Simtable provides digital sandtables to the wildfire and emergency management communities. Combining existing GIS data with next generation agent-based modeling and ambient computing SimTable provides a straightforward easy to use approach in incident response and training. Interactive simulations and realtime maps can be distributed across the web and mobile devices.

Simtable is based in Santa Fe, New Mexico. Current research and development includes LiveTexture which coordinates mobile, aerial and social media videos and photos into one 3D texture of an ongoing incident.

Technosylva, Inc.
http://technosylva.com/

Solutions for Wildfire Protection Planning & Operational Response from San Diego (CA).

Technosylva has developed the only specific wildfire management tools in the market, used in agencies since 1997.

FIRESPONSE: Unique Decision Support System for Wildland firefighting from the dispatching to the incident management, available in desktop, web and mobile platforms.

WILDFIRE ANALYST: the ultimate tool for analyzing real-time Wildfire Behavior.

Our team has a rich legacy in conducting fuels mapping, fire behavior analysis and wildfire risk assessments, focused on integrating analysis results into usable applications to support fire professionals for protection and mitigation planning, as well as response and suppression.

US Forest Service - Stress Control and Resiliency
The wildland fire community, which includes the Forest Service, wildland firefighters, emergency medical service (EMS) and law enforcement personnel, and their families, may experience traumatic stress due to the nature of their work. A healthy mind and body are essential to individual and unit readiness. Resilience combines mental, emotional, spiritual and physical skills to generate optimal performance (i.e. readiness) - in combating wildland fires, in healing after injury, and in managing your work and home life. Fatigue, nutrition, stress control, purpose and values, and total well-being are all facets of resilience. The USFS is promoting resiliency through means of managing stress for optimal health and productivity.

Wildland Firefighter Foundation
http://www.wffoundation.org/

The role of the Wildland Firefighter Foundation is to honor past, present, and future wildland firefighters by helping maintain and grow the national monument established for those who have lost their lives, operate a financial fund providing assistance to the families of fallen and wildland firefighters and to injured firefighters, and partner with private and interagency organizations to educate the public about wildland fires and promote excellence and safety in firefighting.

We provide financial assistance, immediate and ongoing emotional support, advocacy, and recognition to fallen and injured wildland firefighters. We present program information and in some instances, onsite crisis support, to government and private fire agencies and other organizations.

Survivor family members are forever a part of the Foundation's purpose. We continue to provide emotional support and in some cases financial support many years after a firefighter's death. Additional support may include holiday sponsorships for families with young children, travel expenses to attend survivor gatherings and recognition programs, and counseling for immediate family members.

ORAL PRESENTATIONS

MEASUREMENT AND FIRE

1. Do we have an acceptable loss in Wildland Fire?

Presenter(s): Ivan Pupulidy, Director of the USFS Office of Learning

Additional Author(s):
Matt Carroll
Curtis Heaton

Do we have an acceptable loss of life in the wildland fire service? This question is fundamental to the development of strategy and tactics, but it appears to be largely unexplored. One primary reason for this may be that posing this question leads towards a binary impasse. If we accept a certain number of fatalities then we can continue to fight fire as we always have. Alternatively, if we have no acceptable loss (e.g. zero fatality) we must stop fighting fires altogether. The choice seems to be all or nothing, 0 or 1. Moving this discussion forward is essential for the wildland fire community, but will require language, concepts and processes for navigating the grey space in-between the binary extremes.

Exploring the space between these two extremes may allow the community to discover a new way to achieve a wider set of goals. The first step may be to understand that the act of engaging in this conversation does not have to lead to either extreme. This frees us to challenge deeply held cultural beliefs, language and behaviors without fear of inadvertently undermining the community's existence.

Avoiding the question of whether we have an acceptable loss of life is not possible, because it is not a question of whether it will be discussed, and may instead be a question of who will enter into the discussion; the stakeholders abound and they include the wildlland fire community, the public we serve, leadership, the environment, to name a few.

The Forest Service Office of Learning (OOL) is committed to this challenge. In this session we will discuss the intent, approach and placement of the OOL in the hopes of generating broad collaborative support for understanding and facilitating these and other vital conversations.

Keywords: Acceptable loss, risk, dialogue

Bio: Ivan Pupulidy is the Director of the USFS Office of Learning. In 1995, Ivan became a USFS Lead Plane Pilot and later a Regional Aviation Safety Manager. Ivan completed several internationally recognized programs in safety program management and accident investigation and is currently completing a PhD program at Tilburg University in the Netherlands. Ivan also flew HU-25 Falcon Fan-Jets at Coast Guard Air Station Corpus Christi, Texas and subsequently HC-130 Hercules aircraft, at Air Station Sacramento. Following the US Coast Guard, Ivan flew for the US Air Force Reserves in Iraq and Afghanistan and humanitarian support missions throughout central Africa.

2. Network Management and Performance on Complex Fire Events

Presenter(s): Branda Nowell

Additional Author(s):
Toddi Steelman,Executive Director & Professor School of Environment and Sustainability, University of Saskatchewa

Complex wildfire events in the wildland urban interface (WUI) necessitate the involvement of a range of responders representing fire operations, emergency response operations, local government, and the media. Effective

communication and coordination among these different actors is critical to an effective response. A network perspective can provide a valuable lens for both understanding and assessing relational risk for problematic communication and coordination to occur on an incident. Incident response networks represent the collection of organizations and agencies who have a formal responsibility to respond during a fire event. When a network perspective is adopted, the focus is not on the effectiveness of any single agency but rather on the performance of the incident response network as a whole. In this presentation, we present a framework for assessing performance of incident response networks during complex fire events. This framework was applied to assess the network performance of incident response networks on 21 WUI fires. Findings from this research shed light on the network structure of incident response and offers several key lessons in how responders can better manage networks in order to better manage wildfires.

Keywords: relational risk, social networks, network management

Bio: Branda Nowell, is an organizational-community psychologist specializing in inter-organizational relationships, social networks, and community capacity for multi-agent collaboration and coordination within complex problem domains. She teaches courses in organizational behavior, change management, organizational theory, and program evaluation. As an interdisciplinary scholar, she integrates community and organizational psychology with public management to better understand community-based networks of public and nonprofit agencies working in a common problem domain. She currently co-leads a research team (firechasers.ncsu.edu) focused on advancing the science of adaptive capacity toward more disaster resilient communities. Since 2008, this team has worked in collaboration with incident management teams on research aimed to improve inter-agency coordination and communication during large scale wildfire events.

3. Towards metrics of success in residential preparedness for wildfire

Presenter(s): James D. Absher, Ph.D.

Additional Author(s):
Jerry J. Vaske, Ph.D., Professor, Colorado State Univeristy
Katie M. Lyon, Graduate research assistant, Colorado State University

Wildfire preparedness ranges from simple defensible space (DS) actions to more complex structural or landscape changes. Programs like Fire Adapted Communities, FireSafe Councils, CWPPs, communication/outreach and regulations for individual clearance and preparation programs stand on solid reasoning, and provide a basis for hope to achieve residential loss mitigation. Both scientific surveys and anecdotal reports have examined the relationship of beliefs and attitudes through to expectations and intentions to comply. Missing are outcome focused metrics based on actual success. Data from a social survey of wildfire preparedness in Colorado (n=863; 65% mail, 35% internet) was combined with actual on-site assessments (conducted post-survey) for a subsample of respondents (n=75). Site inspections used a standardized form with 25 aspects rated on a 1 to 3 scale. This presentation compares the expectations and intentions to do DS actions with actual site conditions. About half of the inspections (53%) had "excellent" DS completion scores, and the remainder were in the "average" category. Respondents who participated in the site inspections were generally higher than their survey cohort on scores for DS belief, intention, and risk variables. The challenge is to understand the full reach of firewise programs from awareness of risks, changing attitudes and perceptions, and intentions to take actions. We conclude with an open discussion of the standards for success metrics and the data needed to implement them in various settings.

Keywords: defensible space, residents' actions, behavior change, success metrics

Bio: Dr. Absher is a research social scientist with over 40 years in the field. He holds degrees in statistics, human biology, natural science and wildland resource science. Initially he held university faculty positions (1978-1995), then worked with the US Forest Service's Pacific Southwest Research Station (1995-2015). His work on wildland fire has focused primarily on residential compliance with firewise actions, community preparedness and policy/program support in California and Colorado. He has authored numerous reports and publications on aspects of this problem area and, although now retired, strives to continue this line of work with various colleagues.

RISK

4. Wildfire risk management in Europe: the challenge of seeing the "forest" and not the "trees"

Presenter(s): Fantina Tedim, PhD, Assistant professor, University of Porto, Portugal

Additional Author(s):
Vittorio Leone, Full Professor, University of Basilicata (retired)
Gavriil Xanthopoulos, Researcher, Institute of Mediterranean Forest Ecosystems and Forest Products Technology

In Europe, after decades of fire exclusion policies, it has been recognized that fire suppression alone is not able to solve wildfire problems. Firstly, it is able to mitigate the fire consequences but it is unable to reduce man-induced ignitions. Secondly, suppression capabilities are reaching their budgetary limits. Thirdly, very restrictive legal frameworks aggravated wildfire problems mainly in rural societies where fire was almost criminalized, applying constraints inspired by an anti-fire bias, irrespective of the role of fire as a traditional tool.

In a context of climate change, with expected scenarios of frequent and extreme fires the reinforcement of preventive actions is mandatory to reduce wildfire severity. Prevention must focus on diminishing fire hazard frequency and intensity as well as reducing vulnerability both related with different social processes.

Signs of change in European wildfire policies are already going on but they still focus on "trees" missing the" forest", i.e. they focus on discrete elements that influence fire occurrence and severity rather than on the whole human-fire-landscape system. Without understanding the complex interdependencies in this system it is hard to develop efficient prevention strategies to contain fire risk, and to avoid the possibility that fire from beneficial element can became a detrimental one.

To avoid the pitfalls of treating human-fire-landscape system components as oversimplified black boxes, the behavior of the "forest" not just the "trees" should be explained and predicted. This perspective is important in Europe, where the small size of scale, the presence of cultural landscapes and heritage of the past, the high density of conservation areas and the relatively reduced extent of forests co-exist with new trends in settling, lifestyle, and recreation demand that play complementary roles in the development of wildfire risk.

The purpose of this paper is to reply to the current wildfire risk management challenge as a contribution towards developing a framework for fire management based on a holistic knowledge of the interrelationships between environment and social dynamics to support effective wildfire prevention policies. The integration of physical, biological, social, and cultural fire paradigms is mandatory to develop coherent nature and social based fire prevention solutions.

Keywords: Fire exclusion, fire hazard, fire suppression, human systems, prevention, risk management

Bio: Fantina Tedim is Assistant Professor in the Geography Department at the University of Porto, Portugal. She received her Ph.D. in Human Geography from University of Porto in 2000. Her current research focuses on disaster risk reduction, vulnerability and resilience assessment using a multi-hazard approach (e.g. wildfires, floods, coastal erosion, tsunamis). Her research in wildfires focuses on understanding the complex interdependencies in the human-fire-landscape system. In the last three years she published several works on large fires, megafires, wildfires causes, and vulnerability assessment.

5. Localized Risk Perception on Wildfire Hazard

Presenter(s): Voravee Chakreeyarat, Department of Environment and Society at Utah State University

Additional Author(s):
Mark W. Brunson
Peter D. Howe

The need to protect lives and property in the expanding wildland-urban interface (WUI) across the American West increases the pressure to reduce risks of wildfires. As wildfire hazard continues to accelerate, state and federal agencies and local fire departments are challenged to create local risk reduction, either through individual landowner decisions or collective action within the community. A community's perception of exposure to wildfire risk plays the important role for landowner decisions to protect private lands from wildfire hazard. However, in order for community members to be mobilized against wildfire hazard they must perceive that a risk exists. In this presentation, we address the association between landowners' risk perceptions and actual measured wildfire risk that varies across hazard zones in three states (Arizona, California, and New Mexico), testing whether local wildfire risk perception is significantly associated with scientifically measured wildfire risk. This study employed a spatial stratified random sampling scheme based on respondents' hazard zone and proximity to the WUI. This technique ensures a consistently representative sample of perceived risk relative to objective risk over the study area. Employing a multilevel model of responses from community public opinion surveys combined with the wildfire risk potential map, we investigate a pattern of risk perception and the relationships between individual perceived wildfire risks in multi-scales. Results suggest that respondents who reside in a location with high exposure to wildfire describe their risk slightly consistent with the objective hazard measure. The respondents' perception tends to be optimistic about their particular local areas compared to the areas at the broader scale.

Keywords: wildfire, risk perception, multilevel analysis, survey methods

Bio: Voravee is a graduate student in the Department of Environment and Society at Utah State University. She is interested in the interface of human perceptions related to risk of wildland fire. Her research examines the adaptation of human behaviors subject to environmental changes and the spatial relationship of risk perceptions and a process of decision-making. She explores how spatial location affects human decision and behaviors using quantitative approaches including spatial analysis, multilevel modeling, and the application of remotely sensed imagery.

6. Fire and Fuel Management in Banff National Park;Balancing Risk and Sustainability

Presenter(s): Robert Osiowy,Msc., Restoration Specialist ,Parks Canada Agency, Banff National Park, IAWF member

Additional Author(s):
Jane S. Park, Msc.,Fire and Vegetation Specialist,Parks Canada Agency,Banff National Park

Montane forests in Banff National Park's Bow Valley historically experience wildfire events at intervals of less than 100 years. The Town of Banff and the Bow Valley are the most heavily populated areas of Banff National Park, receive more than 3.5 million visitors per year and contain critical infrastructure. Due to wildfire protection, continuous forest stands with significant forest fuel accumulation exist adjacent to major values at risk and within ecologically sensitive areas. These stands may support the development of rapidly moving, high intensity crown fires under frequently occurring fire weather conditions (i.e. 80th percentile conditions). A two-year study found two major fire management needs: 1) Managing the threat of large wildfires; 2) Reducing fuel loading, flammability and potential fire intensity in interface zones.

Fire management in Parks Canada is conducted within a national framework of legislation, policies, and management directives. The Agency's dual fire mandate directs that wildland fire be managed from the perspective of maintaining ecological integrity while protecting public and infrastructure from wildfires. Banff National Park is creating a 'Fire-Smart' landscape using a combination of fuel reduction at the urban-wildland interface and landscape-scale firebreaks to facilitate the use of prescribed fire and support indirect confinement of wildfires. The approach utilized in Banff National Park ensures that fire is managed in a socially acceptable, fiscally responsible and ecologically sustainable manner.

Since 2002, the Banff National Park Fire Management program has completed 128 hectares (316 acres) of fuel treatment adjacent to the town of Banff and more than 200 hectares (500 acres) within the Bow Valley at the landscape scale. These fuel management units will require continuous and ongoing maintenance to remain as effective fuel breaks over time. Maintaining these fuel breaks, will continue to facilitate fire use to achieve larger ecological objectives. This presentation discusses how the Banff National Park Fire Management program balances dual objectives of wildfire protection and ecosystem sustainability in Banff National Park's Bow Valley.

Keywords: National Parks, Fire Management, Fuel Management,Fuel accumulation,Ecologically sensitive areas,Wildfire Risk, Ecosystem Sustainability,Infastructure,Community Protection

Bio: Robert Osiowy has been with Parks Canada Agency for 13 years in various capacities within the National Fire Management Program. Most recently,he has taken the team leader role for the Restoration Program within Banff National Park.Robert has been a member of a Parks Canada National Incident Management Team since 2007 in both the Plans and Operations sections.Robert has a Master's degree in Environmental Management and worked with Dr. Brad Hawkes of the Canadian Forest Service on his thesis project : " FUEL LOAD AND FIRE BEHAVIOUR IN MONTANE RIPARIAN WHITE SPRUCE FORESTS OF BANFF NATIONAL PARK; STRATEGIES FOR COMMUNITY PROTECTION AND ECOSYSTEM SUSTAINABILITY"

7. Risk - Risk Tradeoffs in Wildfire Management – The Ranch Fire Case Study

Presenter(s): Dave Calkin, PhD, Research Forester, USDA Forest Service Rocky Mountain Research Station

The primary objective of federal wildland fire management is community and fire fighter safety. Alternative wildfire management strategies vary in terms of potential damage to human communities and highly valued natural resources, the amount of future risk reduction achieved by a wildfire, and the type, quantity and quality of firefighting resources that are exposed to the hazards of the wildfire environment. Given the tragic outcome on the Yarnell Hill fire in 2013, fire managers are currently particularly sensitive to the conditions under which ground based firefighting crews work. Given this sensitivity, managers may be less likely to select aggressive ground based suppression strategies compared to strategies that rely more heavily on aviation resources, or select more indirect "big box" strategies. In this presentation I

review the complicated decision making environment and describe the relative tradeoffs among the quantity and quality of firefighter exposure as well as the potential outcomes to highly valued resources and future risk reduction. These tradeoffs will be discussed relative to the 2014 Ranch Fire in the Sequoia National Forest, California.

Keywords: Risk-Risk Tradeoffs, Wildfire Suppression

Bio: Dave Calkin is a Research Forester in Human Dimensions Program at the US Forest Service Rocky Mountain Research Station in Missoula, Montana, USA. Dave is the team lead of the Fire Economics group of National Fire Decision Support Center, a joint agreement between Fire and Aviation Management and Research intended to improve risk based fire management decision making through improved science application and delivery. Dave's research incorporates economics with risk and decision sciences to explore ways to evaluate and improve the efficiency and effectiveness of wildfire management programs.

NEW DEVELOPMENT IN WILDLAND FIREFIGHTING

8. Changing cultures/attitudes in aerial firefighting - Pre determined dispatch of aircraft

Presenter(s): Wayne Rigg, Operations Officer - CFA AViation Officer

Pre-determined Dispatch (PDD) of aircraft was developed in response to the Victorian Bushfire Royal Commission (VBRC).

Recommendation 20:-

- Establish a system that enables the dispatch of aircraft to fires in high-risk areas without requiring a request from an Incident Controller or the State Duty Officer.

A team was established and trial objectives set:-

- Rapid initial attack.
- Have processes in place that utilise aircraft in a safe, efficient and cost effective manner.
- Collect trial data that enables determination of trial outcome.

A number of operational gains were identified during the trial:-

- The deployment of the aircraft via pager resulted in rapid initial attack of fires and did not have to rely on ground crews arriving on scene and undertaking a size up before requesting aircraft.
- Within suppressible limits, fire size and duration were significantly reduced, with a large reduction in cost, damage and committed resources.
- Immediate intelligence from the Air Attack Supervisor to the fire ground enabled faster and more accurate decisions. This assisted with the issuing of community warnings and decisions around resource requirements.

The average dispatch time from pilot notification to aircraft airborne was 8.4 minutes, compared to an average of 34 minutes via conventional methods.

Since the successful 2012/13 trial PDD was expanded to 5 locations throughout Victoria in 13/14 and is in the process of being expanded into 10 locations for the 14/15 bushfire season.

PDD has shown that traditional methods of dispatching aircraft can be improved, however a range of issues need to be addressed when changing deeply embedded systems and cultures.

Regardless of the benefits resistance remains within some ranks and changing attitudes and demonstrating the benefits of rapid deployment of aircraft in support of ground crews continues to be a challenge.

Demonstrating the cost benefit analysis by investing in aircraft early in the fire require further in depth research and modelling to demonstrate what the use of aircraft in support of ground crews saved rather than what they cost.

Keywords: Aircraft Operations

Bio: Operations Officer Wayne Rigg is the CFA Aviation Officer responsible for the planning and delivery of the aviation program for CFA in Victoria.
Wayne has been a career firefighter since 1995 and is an accredited Air Operations Manager, Air Attack Supervisor, Air Observer and 1 of 4 State Aircraft Coordinators within Victoria.
Wayne is the CFA lead on the implementation of PDD and will speak on the challenges faced in changing systems, ideas and opinions within a deeply imbedded aviation culture within Victoria.

9. Fire and Aviation Management Enterprise Geospatial Portal

Presenter(s): Jill Kuenzi. Geospatial Coordinator, US Forest Service Fire and Aviation Management

Additional Author(s):
Sean Triplett. Geospatial Manager, US Forest Service Fire and Aviation Management
Jill Kuenzi, Geospatial Coordinator, US Forest Service Fire and Aviation Management

The U.S. Forest Service Fire & Aviation Management (FAM) program continues to innovate in the management and suppression of wildland fires. The FAM Enterprise Geospatial Portal (EGP) project was undertaken to improve the delivery, display, and analysis of geospatial information to support the wildland fire management decision-making process. The EGP provides a web-based mapping interface that allows users to access common wildfire data layers on a common interface. The EGP allows for a continuous feed of data, and the ability to combine it with other information. Users also have access to data stored in a central data repository to facilitate the exchange of information within and between land management agencies. The EGP is comprised of two systems of web-mapping and database components utilizing up-to-date Google and Esri technologies. These two systems organize data into View States, of like datasets based on common fire business areas. The data within the View States provide access to fire management personnel, dispatchers, and coordination centers with up-to-date fire information including fire perimeters, satellite fire detections, currently assigned resources, and the availability of other resources. The EGP tool allows for the continued improvement in fire management by bringing data and cooperating partners together.

Keywords: Wildfire, EGP, web-mapping, geospatial, database

Bio: Jill earned BS degrees in Mathematics and Natural Science, and an MS in Wildlife Biology. Jill has worked for the federal government for 22 years, primarily with the National Park Service and U.S. Forest Service, in areas of wildland and prescribed fire, many of the natural sciences, and GIS. Jill currently works as the U.S. Forest Service Geospatial Coordinator for the Fire and Aviation Management's Information Technology (FAM IT) at the National Interagency Fire Center (NIFC) in Boise, ID. Jill spends much of her time supporting work with agency and interagency data standards, and supporting a variety of wildland fire applications including the Enterprise Geospatial Portal (EGP).

10. Military Veterans in the Wildland Fire Service – Issues, Obstacles, and Benefits

Presenter(s): Alexis Lewis Waldron, PhD, Post Doctoral Scholar, Oregon State University

Additional Author(s):
Vicki Ebbeck, Associate Professor, Oregon State University

Forbes Magazine (February, 2014) recently wrote that military veterans entering the US workforce have many untapped, transferable skills – especially regarding leadership – that are often overlooked by their employers. A high number of returning service members are seeking employment on their return from duty with land agencies – one main area is with wildland fire. It is imperative that the fire service gains an understanding of obstacles veterans face, discover untapped, and transferrable skills, and best utilize these skills to increase overall performance and develop and enhance working relationships with fellow crewmembers and supervisors.

In an effort to investigate this process one solo, and two group exploratory interviews were conducted with recent military veterans. The aim of these interviews was to explore veterans experiences in the military and current positions as employees of land agencies in order to gain a baseline understanding of veteran experiences, knowledge, abilities, future developments, and areas for more formal research. Five major themes were explored, including fire service entry, obstacles, attitude, leadership, and training. Results indicate that successfully integrating veterans into the fire service is a complex process. It is one that involves educating and communicating clearly with veterans on what to expect, and educating and communicating clearly with supervisors on how to best utilize veteran skillsets. More detailed results that discuss the five themes will be explored in the presentation.

Keywords: Veterans, Education, Wildland Firefighters, Supervisors, Communication, Obstacles, Attitude, leadership, training

Bio: Dr. Waldron has been a wildland firefighter for 10 seasons on hand crews, engine crews, helitack crews, and heli-rappel crews, and has served as a human factors specialist for fatality incidents. Based on hers and others near misses/accidents and leadership experiences in fire she has developed a drive to build and enhance fire trainings and tools based on what firefighters have expressed is important. Dr. Waldron has used the tools developed with firefighters not only to develop firefighters personally and professionally, but also various athletes, challenge course facilitators, and other outdoor professionals.

11. Organizational Response to Incidents and Accidents

Presenter(s): Ivan Pupulidy, Director of the USFS Office of Learning

The Coordinated Response Protocol and Learning Review: Our approach to accident reviews embraces the idea that knowledge resides in a large number of places, both inside and outside the organization. The Coordinated Response Protocol (CRP) is an effort to unify or coordinate the numerous investigative interests following a fatality event. The Learning Review is inclusive of multiple approaches of analysis, perspectives and sources of information. This means that those engaged in a Learning Review must be humble enough to recognize that they may not have the answers to complex questions and that learning is a fundamental way to prevent accidents.

This process recognizes that accident prevention is a shared goal that transcends organizational boundaries and hierarchies and may result in revealing hard truths.
This presentation is designed to explain the purpose and intent of the CRP/LR

Keywords: Learning, accident prevention, prevention, group sensemaking

Bio: Ivan Pupulidy is the Director of the USFS Office of Learning. In 1995, Ivan became a USFS Lead Plane Pilot and later a Regional Aviation Safety Manager. Ivan completed several internationally recognized programs in safety program management and accident investigation and is currently completing a PhD program at Tilburg University in the Netherlands. Ivan also flew HU-25 Falcon Fan-Jets at Coast Guard Air Station Corpus Christi, Texas and subsequently HC-130 Hercules aircraft, at Air Station Sacramento. Following the US Coast Guard, Ivan flew for the US Air Force Reserves in Iraq and Afghanistan and humanitarian support missions throughout central Africa.

FIRE ADAPTED COMMUNITIES

12. Measuring Community Adaptive Capacity and Wildfire Risk in the American West: Coupling Results from Key Informant Surveys and Biophysical Risk Analysis

Presenter(s): Max Nielsen-Pincus, PhD, Assistant Professor, Portland State University

Additional Author(s):
Travis Paveglio, Assistant Professor, University of Idaho
Alan Ager, Operations Research Analyst, United States Department of Agriculture Forest Service, Western Wildland Environmental Threat Assessment Center

New approaches for managing wildfire risk are needed as uncharacteristically large wildfires in the western United States (US) and elsewhere strain government capacities for suppression. Although federal policy and local planning for wildfire risk have improved during the past decade, continued and growing wildfire losses in the wildland urban interface (WUI) suggest that existing policies and programs to mitigate risk are insufficient or require more efficient strategies for implementation, including the Community Wildfire Protection Planning (CWPP) process. Recent literature has identified a number of community archetypes with different potential fire-adaptation pathways and case studies of local communities have identified community adaptive capacity to wildfire as a critical determinant of effective risk mitigation, where adaptive capacity is commonly defined as the ability for a community to self-organize to reduce the undesired consequences that might otherwise occur from wildfire. However, biophysical characteristics also play an important role in determining community fire adaptation pathways. We use the term fireshed to define the area of the landscape most likely to transmit wildfire risk to a community. A community fireshed can be mapped to identify both the degree of risk and the sources of risk (e.g., public lands, private lands, or lands with management restrictions such as wilderness or other reserves). In this project we combined data about community adaptive capacity from structured interviews with key informants (n=114) in 70 unique communities in the western US that had recently experienced a large wildfire

with fireshed mapping to examine the degree and sources of risk for each community in addition to each community's capacity to manage that risk. Results help to empirically identify different types of communities with different potential pathways to wildfire resiliency, and can assist with prioritizing different strategies to mitigate wildfire risk in an environment of limited resources (e.g., fuels treatments on nearby federal lands versus grants to communities for preparation or infrastructure upgrades). We discuss the implications of our findings for local community self-assessment as well as for achieving the fire-adapted communities objective in the National Cohesive Wildland Fire Management Strategy.

Keywords: Adaptive capacity, community, fireshed, mitigation, wildfire risk

Bio: Dr. Nielsen-Pincus is an assistant professor of environmental science and management at Portland State University's School of the Environment. His research on social-ecological systems includes a focus on wildfire social science. He has contributed to and led projects related to landowner fuels management behaviors, community-based wildfire risk mitigation planning, and the effects of large wildfires on local labor markets. Dr. Nielsen-Pincus teaches graduate and undergraduate students in the Department of Environmental Science and Management about environmental management and policy. Prior to joining the faculty at Portland State University, Dr. Nielsen-Pincus was a faculty research associate at the University of Oregon.

13. Creating a Culture of Adaptation: A Learning Network Approach to Fire Adapted Communities

Presenter(s): Michelle Medley-Daniel, Fire Adapted Communities Network Program Manager, The Watershed Center

The Fire Adapted Communities Learning Network (FAC Network) is an innovative approach to accelerating wildfire adaptation efforts across the US. Modeled after the Fire Learning Network, which has been operated by The Nature Conservancy and their federal and community partners for nearly a decade, the FAC Network connects communities that are working to create more resilient landscapes, communities and institutions.

The multi-scalar, cross-sector approach to adaptation that is being demonstrated by FAC Network participants offers lessons about resilience, community relationships to fire, and varied organizational cultures and approaches. Brief case stories profiling several of the communities participating in the FAC Network will offer attendees insight into how these communities are learning, adapting and sharing innovations and best practices.

This session will also offer lessons about how to connect grassroots and community leaders with regional and national partners and institutions to spread innovation. Insights into how to develop and manage an effective learning network including creating and maintaining remote dialogue and workspaces, cultivating relationships, and effective "net weaving" will be covered.

Participants in this session will also preview the fire adapted community self-assessment tool (currently in beta testing within the FAC Network) and other emerging tools and resources being used by the FAC Network to adapt to living more safely with wildland fire.

Keywords: Fire Adapted Communities, Learning Network, Culture, Resources, Case Studies

Bio: Michelle Medley-Daniel is the Watershed Research and Training Center's Fire Adapted Communities Learning Network Program Manager. In her role she both manages the network's operations for the organization, and also acts as a liaison in the network—directly working with communities throughout the west to improve their wildfire resilience. She holds bachelor's degrees in English and Studio Art from Humboldt State University. For the past ten years Michelle has been coordinating networks of environmental educators and rural communities, as well as providing communications and development services to non-profits.

14. Enhancing Community Response-Utilising existing information networks during bushfires

Presenter(s): Kathy Overton, Director, Kathryn Overton Consulting

Inquiries undertaken after major bushfires in Victoria Australia invariably mention difficulties with information flow to and throughout communities during bushfires, as well as highlighting that a significant number of people continue to be unprepared for bushfires when they occur.

Considerable improvements in the timing and dissemination of warnings and information during bushfires have occurred since the Black Saturday Bushfires of 2009. Emergency Service Organisations (ESOs) have given increased priority to the provision of information to communities under threat of bushfire. Great emphasis is placed on planning for bushfires, both at personal and community level by fire agencies.

However, people without bushfire plans and people getting helpful, reliable, timely, and tailored information, when and how they need it during bushfires, continue to be major challenges. Understanding how communities communicate and disseminate information outside of times of disasters will help develop strategies that will assist during times of disaster. Connecting existing emergency structures and processes with existing community networks and processes during bushfires and other emergencies must be considered if we are to increase the effectiveness of community response.

Building on a project undertaken in 2011, this presentation discusses ways that local governments and communities (including ESOs), may work together to better utilise existing information networks within communities during disasters. It will also encourage discussion on how new approaches may enhance community response and resilience when bushfires threaten, as well as barriers to changing perspectives.

Keywords: existing, networks, connecting, barriers, trust, complexity, support

Bio: As a result of training as a firefighter during her time as an environmental educator, Kathy Overton went on to work as a fire educator and community engagement specialist for Victorian fire agencies for 12 years. During that time Kathy was responsible for the coordination of the early development of the AIIMS Information Officer role and training for the Victorian Government's forest firefighting organisation. More recently she has supported fire agencies in the improvement of warnings and community information dissemination during emergencies. For the past three years her foremost interest has been community response during bushfires, primarily the importance of community networks in dissemination of information.

15. You Mean It might Burn? Embarking on Austin's Journey to Become Fire Adapted

Presenter(s): William A. Conrad CPRM

In September of 2011 Central Texas experienced its worst fire season in recorded history. On Labor Day the Bastrop Complex Fire ignited, eventually consuming 34,000 acres of woodlands and communities involved in the Wildland Urban Interface, razing 1700 homes, and taking two lives. That same day the Spicewood Fire ignited in western Travis County in a similar Wildland Urban Interface. More than 6,000 acres burned and thirty six homes were lost. Simultaneously, a small fire started in an electrical distribution right-of-way. It quickly jumped a major highway spread rapidly into a wildland and spotted in to the densely populated Steiner Ranch Community resulting in the loss of twenty one homes with the evacuation of thousands of residents. Until that day Austin, Texas and communities in surrounding Travis County prided themselves in their green infrastructure. parkland, preserves, water quality management areas, and green belts were all viewed by residents as sacred community assets to be protected from any disturbance. However, local fire officials and land managers had long understood risks to life and property, as well as to those urban Wildlands, posed by potential wildfire. But they struggled to engage the community. The events of September 4, 2011 served as the catalyst to engage communities in Austin and Travis County in efforts to become the Fire Adapted Community that fire and public officials had been striving to advance for more than a decade. However, now those officials had to work with various stakeholders to overcome a new found fear, and focus on the nature of Wildland fire in a complex Wildland Urban Interface. Today, stakeholders from all facets of the communities and fire agencies collaborate through the Austin Travis County Joint Wildfire Task force, with a mission of making our communities fire adapted.

Keywords: Wildfire, Fire Adapted, WIldland Urban Interface,Collaboration

Bio: Willy Conrad has been responsible for managing Austin Water Utility's Wildlands since July 19, 1999. He is a 1978 graduate Of Stephen F. Austin State University with a Bachelor of Science in Forestry.
He serves as an Environmental Policy Program Manager for Austin Water Utility and is charged with management of the Utility's Wildland Conservation Division, assuring mission oriented management of more than 42,000 acres of urban Wildlands.

Willy is a member of the International Association of Wildland Fire, Society for Range management, Natural Areas Association, and the Soil and Water Conservation Society of America.

PEOPLE, CLIMATE AND LANDSCAPES

16. Investigating the Impacts of Surface Temperature Anomalies Due to Wildfires in Northern Sub-Saharan Africa

Presenter(s): Trisha Gabbert, Student, South Dakota School of Mines and Technology

Additional Author(s):
Charles Ichoku, Research Physical Scientist, National Aeronautics and Space Administration (NASA)
Toshi Matsui, Research Associate, National Aeronautics and Space Administration (NASA) and Science Systems and Applications, Inc. (SSAI)
William Capehart, Atmospheric and Environmental Sciences Program Coordinator and Associate Professor, South Dakota School of Mines and Technology

The northern Sub-Saharan African region (NSSA) is an area of intense study due to the recent severe droughts that have dire consequences on the population, which relies mostly on rain fed agriculture for its food supply. This region's weather and hydrologic cycle are very complex and are dependent on the West African Monsoon. Different regional processes affect the West African Monsoon cycle and variability. One of the areas of current investigation is the water cycle response to the variability of land surface characteristics. Land surface characteristics are often altered in NSSA due to agricultural practices, grazing, and the fires that occur during the dry season. To better understand the effects of biomass burning on the hydrologic cycle of the sub-Saharan environment, an interdisciplinary team sponsored by NASA is analyzing potential feedback mechanisms due to the fires. As part of this research, this study focuses on the effects of land surface changes, particularly albedo and skin temperature, that are influenced by biomass burning. Surface temperature anomalies can influence the initiation of convective rainfall and surface albedo is linked to the absorption of solar radiation. To capture the effects of fire perturbations on the land surface, NASA's Unified Weather and Research Forecasting (NU-WRF) model coupled with NASA's Land Information System (LIS) is being used to simulate some of the fire-induced surface temperature anomalies and other environmental processes. In this presentation, we will report the strategy for these simulations, and show some preliminary results.

Keywords: sub-Saharan Africa, biomass burning, albedo, skin temperature, NUWRF modeling

Bio: Trisha Gabbert is currently a graduate student working towards a MS in Atmospheric and Environmental Sciences at the South Dakota School of Mines and Technology (SDSM&T). She completed her undergraduate degree specializing in Atmospheric Sciences at SDSM&T as well. During her undergraduate program, she gained experience through two internships at NASA Goddard Space Flight Center. Within one of her internships she was introduced to current research regarding fire emissions and numerical modeling, which she is continuing in her graduate research. She is actively interested in fire weather, fire emissions, and how fire weather will affect our changing climate.

17. How society and climate will combine to affect wildfire in the U.S. South, 2015-2060

Presenter(s): Jeffrey P. Prestemon, Resarch Forester, USDA Forest Service, Southern Research Station

Additional Author(s):
Uma Shankar, Research Associate, Center for Environmental Modeling for Policy Development, UNC-Chapel Hill
Karen L. Abt, Research Economist, USDA Forest Service, Southern Research Station
Ernest Dixon, IV, Forester, USDA Forest Service, Southern Research Station
Aijan Xiu, Research Associate Professor, Center for Environmental Modeling for Policy Development, UNC-Chapel Hill
Keith Talgo, Research Associate, Center for Environmental Modeling for Policy Development, UNC-Chapel Hill
Dongmei Yang, Research Associate, Institute for the Environment, University of North Carolina, Chapel Hill

The long-run effects of climate, land use, demographic, and economic changes will work together to produce wildfire activity in the coming decades. Information on wildfire trends can be used for making investments into wildfire preparedness and can improve our understanding of the long-term consequences of these changes on human health, including air quality. We estimate wildfire production models for the counties of thirteen southeastern U.S. states, with separate models by broad cause category and Ecoregion province These production functions are estimated over historical data from 1992-2010 and then used to project wildfire under nine separate models of the future. These nine models were from three IPCC based-emission/economic-demographic scenarios and three general circulation models used in the 2010 Resources Planning Act Assessment. The nine models are combined in Monte Carlo simulation to provide overall uncertainty in projected wildfire activity. Results show that projected annual areas burned generally

increase for lightning but decline for human-ignited wildfires, in aggregate but that projected trends vary widely by state and Ecoregion province.

Keywords: lightning-caused, human-caused, climate change, societal change

Bio: Jeff Prestemon is a forest economist doing research in the area of the economics of natural disturbances and timber product markets and trade. Specific research topics include understanding and predicting arson, quantifying the net benefits of fire prevention and fuels management, the impacts of hurricanes and insect and disease epidemics on forest product markets, and evaluating the effects of international trade policy. He began work with the Forest Service in 1995. Education is from University of Wisconsin-Madison (Ph.D.), North Carolina State (M.S.), and Iowa State (B.S.).

18. Spatial Pattern of Fire With Respect to Human Settlements in a Tropical Dry Forest Landscape

Presenter(s): Narendran Kodandapani, Associate Professor, Administrative Staff College of India

Additional Author(s):
N. Satheesh, District Forest Officer, Tamil Nadu Forest Department
A.S.Singhar, Additional Principal Chief Conservator of Forests, Tamil Nadu Forest Department

The large dependence by humans on tropical forests to meet livelihood and natural resource needs makes it imperative to quantify and understand the effects of forest degradation. Disturbances such as forest fires are annual events in several tropical forests. We combined information from semi-structured social surveys from 20 villages, with vegetation data on forest disturbance from 341 circular plots from the Sathyamangalam Tiger Reserve (STR). We examined in detail one forest disturbance, forest fires in relation to human settlements. The study also analyzed the effects of landscape structure at multiple spatial scales on forest burnt area. 16 yr of remote sensing data were applied to delineate burned areas, determine fire size characteristics, and to estimate fire-rotation intervals. Fire wood was the most common natural resource extracted from the forest, 98% of the households extracted fire wood from the forests. Between 28% and 52% of households collected a variety of NTFPs (Non timber forest products) from the forests. Forest disturbance index in the STR ranged between 0.1 and 0.5 (minimum of 0 to maximum of 1), with a mean of 0.25 ± 0.09. Annual fire frequency was 159 ± 115 for the STR, mean fire rotational intervals (mFRI), the time required to burn the equivalent of the total forest area, was 44.1 yr. A small percentage of fires account for the bulk of area burned, 10 % of fires accounted for 86 % of the burned area. Small fires ≤ 10 ha are abundant, mean fire size was 10 ha, the largest fire size was 2 425 ha. The spatial pattern of burnt pixels in the STR was explained by distance from the village edges, (R2 = 0.59, Adjusted R2=0.53, F2,14 = 10.28, p < 0.001). the proportion of total burnt area increased with increasing spatial scale in the tropical dry thorn (f1,11=18.67; r2=0.62; p<0.001), and in the tropical moist deciduous forests (f1,11=7.05; r2=0.39; p<0.05). understanding these spatial patterns and drivers of forest change is important for alleviating the impacts of forest degradation in the tropics.

Keywords: Forest degradation, disturbance index, fire regimes, fire size, fire-rotation interval, conservation, tropical forests, spatial pattern, remote sensing

Bio: Narendran Kodandapani is an Associate Professor at the Administrative Staff College of India. His research interests include tropical forest conservation, landscape ecology, and human dimensions of conservation. He completed his PhD from Michigan State University. His dissertation research examined forest fire regimes in seasonally dry tropical forests in the Western Ghats of India.

SPECIAL SESSION ONE: INDIGENOUS PEOPLE AND WILDLAND FIRE

Moderator: Amy Christianson

Despite fairly extensive knowledge on traditional burning practices, little is known about how wildfire is currently managed in Indigenous communities worldwide. Indigenous communities are frequently at high risk from wildfire because they are often situated in isolated, remote locations in landscapes prone to fire. Indigenous populations are increasing rapidly compared with the general population and Indigenous communities often face a range of socioeconomic issues of increasing complexity and severity in some communities, making fire management a lower priority. Social science research with Indigenous populations on fire management can help to inform policy in the face of global changes such as climate change, biodiversity loss and economic change. This special session will host speakers from numerous countries discussing Indigenous People and contemporary wildland fire management.

Keywords: Indigenous, Aboriginal, fire management, social science

19. Wildfire evacuation experiences of a First Nations community in Alberta, Canada

Presenter: Tara McGee, PhD, Associate Professor, University of Alberta

Additional Author(s):
Amy Christianson, Fire Social Scientist, Natural Resources Canada, Canadian Forest Service

In this presentation, we will present results of research carried out as part of the First Nations wildfire evacuation partnership in Canada. The partnership includes eight First Nations in three provinces that have been evacuated due to recent wildfires, researchers, and government and non-government organizations involved in assisting during evacuations of First Nations communities. We will present findings from research carried out with Whitefish Lake First Nation (Atikameg) in Alberta, which was evacuated in the summer of 2011. Interviews were completed with community members who helped to carry out the evacuation, those who were evacuated, and those who stayed behind during the evacuation. In this presentation, we will describe how the evacuation was carried out, residents' evacuation experiences, and factors that positively and negatively influenced residents' evacuation experiences.

Keywords: wildfire evacuation, First Nations

Bio: Tara McGee is an Associate Professor in the Department of Earth and Atmospheric Sciences at the University of Alberta. For the past 15 years, her research has focused on the human dimensions of hazards, mainly focusing on wildfires. Tara leads the First Nations wildfire evacuation partnership.

20. In their words: how a wildfire evacuation affected residents of a Northern Alberta First Nation community

Presenter: Kyla Mottershead, MA Student, Human Geography, Department of Earth and Atmospheric Sciences, University of Alberta

In Canada, fire management agencies recommend the evacuation of a community when wildfires pose a threat to the health and safety of residents. This results in thousands of people being evacuated each year (Beverly & Bothwell, 2011). Although they make up only 4.3 percent of the Canadian population, almost one-third of the wildfire evacuations that took place between 1980 and 2007 involved an Aboriginal community (Beverly & Bothwell, 2011). The remote location and unique sociocultural characteristics of many Aboriginal communities can present challenges for residents and evacuation organizers. However, very little research has sought to understand how Aboriginal residents are affected by wildfire evacuations. This community-based, qualitative study explored how residents of Dene Tha' First Nation (Meander River, Alberta) were affected by a community-wide evacuation called in response to heavy smoke from a nearby wildfire. Data from interviews and focus groups with 31 participants illustrate that the community context and logistical characteristics of the evacuation determined how residents were affected. Three main themes are evident in the participant's discussions of their experiences. First, they focused on the loss of control they experienced over decisions affecting their personal and collective well-being. Second, participants focused on the psychological impacts they experienced. Third, the participants focused on how the evacuation altered their risk perception and desire to implement mitigation and preparedness efforts in relation to wildfires and other local hazards. The findings from this study point to the importance of reducing pre-existing vulnerabilities in order to minimize the negative impacts of wildfire evacuations on Aboriginal communities. This research confirms that evacuations can be difficult for some Aboriginal residents and organizers must develop plans to account for the distinct sociocultural characteristics and vulnerabilities of the communities with which they work.

Reference:
Beverly, J. L., & Bothwell, P. (2011). Wildfire evacuations in Canada 1980–2007. Natural Hazards, 59(1), 571–596. doi:10.1007/s11069-011-9777-9

Bio: Kyla Mottershead is a second year Master of Arts student in the Department of Earth and Atmospheric Science (Human Geography and Planning Program) at the University of Alberta. She has a BA in development studies and geography from the University of Calgary ('10). Her MA research focuses on how residents of a First Nation community were affected by a wildfire evacuation with the goal of mitigating and preventing any negative impacts experienced by First Nation communities during emergency evacuations.

21. Using Historical Photographs to Identify Indigenous Burning Patterns

Presenter: Rick, Arthur, RPFT, CEO Driptorch Consulting Inc.

Identifying historic disturbance patterns is a critical prerequisite before undertaking any ecological restoration or for that matter, planning for landscape or ecological management. Of equal or greater importance, is understanding how those disturbance patterns came into being or were maintained.
Indigenous fire has been recognized as a principle tool for a variety of multiple resource uses and benefits. While the scale of use has been debated, there is increasing consensus that frequent fire maintained certain ecosystems.

In latter stages of ecological succession, the historical use of frequent fire is very difficult to ascertain. There are ecological indicators that can be found through careful assessment and interpretation. Identifying low intensity fire patterns is difficult as it does not leave significant markers on the landscape. These are often lost over time thru successive vegetative types or expansion of coniferous forests.

Historic and repeat photographs often provide some insight but are usually, only a single image or a few images that may or may not represent the landscape. and as such have limited usefulness.
Early Canadian surveyors took systematic glass plate photographs as they surveyed the mountain regions of western Canada. These collections, representing over 140,000 glass plates, dating from 1861, captured landscapes across the entire survey area in a single season, inadvertently capturing a snapshot in time of what these ecosystems looked like, often from different view points.

Through the Mountain Legacy Project, these collections are being identified, digitized, and retaken in effort to explore change in Canada's mountain environments. MLP researchers seek to re-photograph these images as accurately as possible and make the resulting image pairs available for further investigation. With careful interpretation, these collections could represent the equivalent of the Rosetta Stone in understanding patterns and scale of indigenous fire use prior to European settlement as well as providing a baseline for landscape management and change.

This presentation will introduce the Mountain Legacy Project, highlighting some of the findings that these extremely high resolution images have provided to date. Perhaps fire exclusion has had greater impacts to ecological change than fire suppression.

Keywords: indigenous fire, fire patterns, ecological restoration, Mountain Legacy Project, ecological restoration, traditional land use

Bio: Rick's career began on a seasonal fire crew with the Alberta Forest Service in 1974. After graduating from NAIT as a Forest Technologist in 1975, he worked in numerous positions across Alberta until retirement in 2012. He has since started his own consulting company. He has worked on wildfire operations from British Columbia to Ontario, from Yellowstone to the Yukon. He is passionate about most everything he engages in, especially fire history and fire behaviour and uses these skills to reduce the threat of wildfire as well as to restore it to the landscape through the use of prescribed fire.

22. Maori use of fire: traditional use of fire to guide wildfire management in New Zealand

Presenter: E. R. (Lisa) Langer, Senior scientist and research leader, Scion

Additional Author(s):
Grace Aroha Stone, Researcher, Scion

New Zealand's landscape and history have been shaped by fire (te ahi). Māori, the indigenous people of New Zealand, and Europeans have contributed to both through planned and accidental use of fire. Māori had an established fire culture stemming from mythology with associated belief systems and rules surrounding the sacredness of fire and its uses before they arrived in Aotearoa/New Zealand. Fire was regarded the most important of the natural elements of putaiao Maori (natural environment) and was used in the propagation, storage and cooking of a number of crops in hangi and umu which contributed to their stable diet. Fire was also used to aid in the felling of selected trees to make waka (canoe), harden or aid the bending of wood for weapons, and eased shaping bark vessels or baskets used for carrying water or preserving food. European settlers from the early 1800s accelerated the use of fire to clear native forest for land settlement and pasture. Native forest cover has been reduced from approximately 80% to 24% of New Zealand's land cover.

Scion's Rural Fire Research Group has studied historical knowledge on the use of fire by Māori gathered from published literature. Interviews with kaumatua (elders in Maori society) in the eastern Bay of Plenty have added to this by drawing on personal experiences. The research focus has been on the effects of fire on the landscape and traditional use of fire as a primary resource and tool by rural Maori communities.

The events of the past, both written and oral, reveal pertinent background understanding to guide the design of some practical solutions to age-old issues regarding the use of fire. This lays the foundation to understanding current use of fire in rural communities. It also guides future prevention of wildfires resulting from the accidental use of fire by rural communities for land management, recreation or traditional methods cooking still used today especially for large gatherings (e.g. for funerals or celebrations such as weddings).

Keywords: Te Ahi; rural fire; Maori; traditional use

Bio: Lisa Langer has led Scion's social fire research since 2003. Her qualitative research has focused on community resilience and recovery following wildfires, fire danger warning communication, fire insurance, and mitigating the risk of human-caused fires. Recently she completed a contract for the Bushfire CRC leading the New Zealand component of the Effective Communication fire warnings and preparedness project. She has presented her research at international fire conferences in the US and Europe, as well as to Australian and New Zealand audiences.

RISK

23. Inducing Private Wildfire Risk Mitigation: Experimental Investigation of Measures on Adjacent Public Lands

Presenter(s): Joseph Little, Associate Professor of Economics, University of Alaska-Fairbanks

Additional Author(s):
Tyler Prante, Associate Professor, Los Angeles Valley College
Michael L. Jones, Associate Professor, Bridgewater State College
Michael McKee, Professor, Appalachian State University
Robert P. Berrens, Professor, University of New Mexico

Increasing private wildfire risk mitigation is an important part of the larger forest restoration policy challenge. Data from an economic experiment are used to evaluate the effectiveness of providing fuel reductions on public land adjacent to private land to induce private wildfire risk mitigation. Results show evidence of "crowding out" where public spending can decrease the level of private risk mitigation. Findings also indicate that spending on private mitigation efforts increase when information about individual expenditures are made available and spending on public land fuel reductions are conditioned upon a threshold level of private mitigation effort being achieved.

Keywords: Wilfire Urban Interface, risk mitigation

Bio: Dr. Little is an Associate Professor of Economics at the University of Alaska-Fairbanks. He specializes in the areas of environmental and natural resource economics with a particular focus on non-market valuation and applied analysis. Dr. Little is currently the Program Director for the M.S. in Resource and Applied Economics at UAF.

24. Mitigation Behavior to Reduce Wildfire Risk: What Motivates Homeowners to Mitigate Wildfire Risk?

Presenter(s): Hari Katuwal, PhD, Post-doctoral researcher, University of Montana and Tyron Venn, PhD, Associate Professor, University of Montana

Additional Author(s):
Tyron Venn, Associate Professor, University of Montana
Travis Paveglio, Assistant Professor, University of Idaho
Tony Prato, Professor Emeritus, University of Missouri

Homeowners in the wildland-urban interface can reduce wildfire risk by creating defensible space around their property. Research suggests that the likelihood of wildfire related damages can be significantly reduced by improving structural

characteristics and removing vegetative fuels around homes. Even though some mitigation actions are relatively inexpensive, a significant number of homeowners in wildfire-prone areas do not take any mitigation action and do not prepare for wildfire. This study identifies and examines the determinants of mitigation actions to reduce wildfire risk using survey data (N=1155) from Flathead County in northwest Montana. We find that higher perceived risk and information seeking behavior is positively associated with mitigation behavior. Our results suggest that respondents who think mitigation to be ineffective, not their responsibility, costly, or that mitigation destroys natural aesthetics are less likely to take mitigation action. Results also indicate that community programs aimed at reducing wildfire risk and participation in the program designed to reduce wildfire risk have positive effect towards mitigation behavior. A better understanding of these determinants will enable land and fire managers to more effectively motivate homeowners to perform mitigation actions.

Keywords: Wildfire, Mitigation behavior, Home ignition zone, Wildland urban interface

Bio: Hari Katuwal is a Post-Doctoral Researcher in Wildfire Economics and Non-market Valuation at The University of Montana. His areas of specialization lie at the intersection of Econometrics and applied Microeconomics with a specific focus on Environmental Economics. Hari's research is focused on providing information to support public forestland management, particularly in wildfire economics and non-market valuation of natural resources. Hari's current research focuses on examining large wildfire suppression effectiveness and understanding public preferences and effectiveness of wildfire management program.

25. Is the whole greater than the sum of its parts? Homeowner wildfire risk mitigation and community heterogeneity

Presenter(s): Hannah Brenkert-Smith

Additional Author(s):
James Meldrum, Research Associate, University of Colorado
Patricia Champ, Economist, USFS Rocky Mountain Research Station
Chris Barth, Fire Mitigation & Education Specialist, Bureau of Land Management
Travis Warziniack, Economist, USFS Rocky Mountain Research Station

Adaptation to a fire-prone landscape requires action to mitigate the risk. Homeowner decisions to mitigate wildfire risk are complex, influenced by many factors, and are not made in isolation but are made within the context of a broader community. Many potentially relevant characteristics vary across communities, including: programs and approaches to wildfire risk mitigation, capacities to facilitate action (e.g. social capital, financial resources), social norms shaping the acceptability of different wildfire risk mitigation activities and programs, and histories with wildfire events.

In this presentation, we describe the framework the research team developed to investigate the conceptualization, measurement, and implementation of the concept of community level fire adaptedness. We focus on an on-going data collection effort across multiple diverse communities in fire-prone areas of western Colorado. The research expands on previous efforts to characterize the wildfire risk mitigation choices of homeowners by shifting the analytical focus from individuals to communities. We will highlight initial findings from the communities located on the western slope of Colorado to address the issue of how the combined wildfire risk mitigation efforts of community members relates to community level fire adaptedness.

Keywords: Homeowners, community characteristics, fire adaptedness

Bio: Hannah Brenkert-Smith is an environmental sociologist whose work examines social/environmental interactions in the face of environmental change, particularly in the American West. In the past ten years, Brenkert-Smith's work has focused primarily on household and community response to wildfire risk. In particular, this work has focused on risk mitigation decision-making and forest and wildfire hazard planning related to social interactions. Hannah earned her PhD in sociology from the University of Colorado and was a postdoctoral fellow at the Research Applications Lab of the National Center for Atmospheric Research.

26. Potential for Disseminating SAWTI Risk Information: Understanding Information Seeking and Wildfire Preparedness in Southern California

Presenter(s): Anne-Lise Velez, MArch, MPA, Research Assistant, North Carolina State University

Additional Author(s):
John Diaz, Program Evaluation Specialist, Forestry Extension, North Carolina State University
Tamra Wall, Assistant Research Professor Climatology, Desert Research Institute

Southern California is a particularly challenging environment in which to manage and adapt to wildland-urban interface fires. We examine relationships between wildfire knowledge and experience, readiness actions, and media choice to determine how best to integrate preparedness information and the recently developed Santa Ana Wildfire Threat Index (SAWTI) into public information dissemination. Integration of SAWTI into current Southern California wildfire risk communication is important as Meteorological Forest Fire Risk Indices are most effective when they are geographically specific, and SAWTI has been shown to generate accurate 6-day forecasts for Large Fire Potential, providing information that can both allow response agencies to position resources, and can enable the public to better understand and respond to wildfire risk. To best understand how to communicate risk to the public, it is important to understand sources from which the public seeks information both on a daily basis and when a wildfire is in the area. This includes understanding whether people use the same sources for daily and wildfire-specific information; whether they plan to use the same sources in the future; which sources they consider trustworthy and up-to-date; demographic and geographic differences in information seeking, and the relationship between information seeking and wildfire and evacuation preparedness actions. Data are from 459 surveys conducted in 2012 with select residents of San Diego (213) and Los Angeles (245) counties, in California. We find television is the most frequently used source for both daily news and wildfire information, and that most people intend to seek information from the same sources in future fires. We also find support for previous research indicating sources considered trust-worthy are not always those considered the most up-to-date. Wildfire knowledge, experience, and past preparedness actions influence the number of sources from which respondents report seeking information. We note significant differences in the information sources used before and during wildfire by geographic area, with higher percentages of those in more rural areas relying on television, radio, Reverse-911, and friends and family for information during a wildfire. Findings support previous studies recommending two-way communication for event-based and readiness information along with one-way sources like television.

Keywords: Information seeking, wildfire preparedness, risk index

Bio: Anne-Lise K. Velez has master's degrees in Architecture and Public Administration from North Carolina State University (NCSU), where she is currently a PhD candidate in Public Administration. She has been a member of the NCSU FireChasers team since 2010, studying how adaptive capacities such as communication efficacy during incidents relate to more disaster resilient communities. Anne-Lise is writing a dissertation focusing on the inclusion of built historic resources in disaster plans as part of a larger agenda to better understand policies and practices that affect the quality of the built and natural environments.

27. LiDAR based risk assessments in the wildland urban interface: an analysis of pre-fire conditions of the Black Forest fire

Presenter(s): Andrew Karlson, Boise State University

Additional Author(s):
Jason Kreitler, Research Geographer, USGS

Wildland fire risk assessments are an important tool for understanding and communicating risk from wildland fire to homeowners and communities. This is particularly true in the wildland urban interface (WUI) where private structures, available fuels, and a patchwork of land ownership types and governmental jurisdictions provide an opportunity for catastrophic fire losses under severe fire conditions. Aerial photos and satellite imagery are often used to assess the composition and configuration of vegetative fuels for risk assessments. However optical remote sensing cannot quantify the vertical structure of canopy and ladder fuels important for modeling fire behavior, and thus risk. LiDAR (Light Detection and Ranging) data have emerged as a promising remote sensing technology which can quantify the vertical structure in addition to the areal extent of fuels. LiDAR data can also be used to delineate the footprints of built structures, even under tree canopies. As a result, LiDAR data have great potential for risk assessments and in the analysis

of WUI home ignition zones. Here, we present research analyzing the Black Forest fire of June 2013, near Colorado Springs, CO, using pre-fire airborne LiDAR data covering the entire fire. We ask if significant differences emerge in fuel loads within the home ignition zone of destroyed (n=464) and non-affected structures (n~760) intersecting the burned area of the fire. We then compare and discuss how LiDAR data improve the ability to conduct risk assessments in WUI communities through the delineation of structures, and by quantifying the fine scale vertical and horizontal heterogeneity of wildland fuels within the home ignition zone.

Keywords: LiDAR, remote sensing, risk analysis, WUI

Bio: Andrew currently works for and attends Boise State University, studying geology. His work has been in cold regions research, with research focused on snow and icecore chemistry, remote sensing of snow and ice, and spatial and temporal variability within snow.

MANAGEMENT AND GOVERNANCES OF WILDFIRE

28. Wildland Fire Governance: Strategies of Effective Suppression Firms

Presenter(s): Cassandra Moseley, Diretor, Ecosystem Workforce Program and the Institute for a Sustainable Environment at University of Oregon

Additional Author(s):
R. Patrick Bixler, Faculty Research Associate, University of Oregon
Nathan Mosurinjohn, Faculty Research Assistant, University of Oregon
Eric White, Faculty Research Associate, University of Oregon

Understanding the "anatomy" of fire suppression businesses has rural community development implications as locally expended suppression resources positively impact employment and wages in affected communities. The number of local natural resource and fire suppression firms prior to a fire influences the amount of suppression funding that is spent locally during a large fire. However, we know relatively little about fire suppression firms and what drives their business decisions such as where they locate. Firms providing suppression contracting services vary in their size, geographic location, degree of dependency on fire suppression for revenue, specialization of services, and other characteristics. These characteristics, along with regional competition and federal procurement market management practices, likely impact local community business capacity to successfully bid on suppression contracts. This research summarizes the characteristics of fire suppression firms, as a first step toward understanding the drivers of business decisions regarding their participation in the fire suppression contracting market.

Keywords: Suppression, Expenditures, Contractors, Contractor Business Strategy, Local Business

Bio: Cassandra Moseley is the director of the Ecosystem Workforce Program and the Institute for a Sustainable Environment at University of Oregon. At the EWP, she developed applied research and policy education programs, focused on community-based forestry, federal forest management, and sustainable rural development. She is a former board member of the Flintridge Foundation and the Applegate Partnership, and participates in the McKenzie Collaborative. She chair of the USDA's Forestry Research Advisory Council. She has testified before Congress about rural green jobs, rural development, and the working conditions of forest workers. She received her Ph.D. from Yale University.

29. Fire Manager or Market Manager? Administrative Practices for Large Fire Suppression

Presenter(s): R. Patrick Bixler, Faculty Research Associate, Ecosystem Workforce Program, University of Oregon

Additional Author(s):
Cassandra Moseley, Associate Professor and Director of Ecosystem Workforce Program, University of Oregon

Private contractors play a major role in federal fire suppression activities, especially large fires, where spending on contracted resources may be half or more of expenditures. There are relatively small numbers of customers for wildland fire suppression services, with the Forest Service a dominant actor. The federal procurement literature suggests that agencies use strategies such as stimulating the market with competition and using relational contracting to manage weak vendors or market consolidation. We hypothesize that Forest Service administrative practices influence the structure of the wildfire suppression contracting market and the ability of local vendors to compete in that market. Through purposively derived semi-structured interviews with key personnel involved with fire procurement, operations, and dispatch at a variety of levels in the fire management system, we identify the major ways that Forest Service administrative practices influence the fire suppression market. We also examine the extent to which the Forest

Service influences those markets through institutional structures, organizational incentives, and social factors such as relationships and broader networks.

Keywords: Suppression, Markets, Market Management, Expenditures

Bio: R. Patrick Bixler is a Faculty Research Associate in the Ecosystem Workforce Program at the University of Oregon. His current research is focused on the intersection of ecology, economy, and governance across a range of issues relevant to forest disturbance and western public lands management. This includes wildfire suppression, bark beetle infestations, and collaboration. He is interested in the ways that networks and relationships facilitate conservation efforts and link local actions to landscape-level outcomes. He completed his PhD in Environmental Sociology at Colorado State University and was a post-doctoral research fellow at the Pinchot Institute for Conservation in Washington DC. He is currently a University Fellow at the Pinchot Institute.

30. The Influence of Incident Management Teams on Suppression Resource Use

Presenter(s): Michael Hand, Economist, USDA Forest Service, Rocky Mountain Research Station

Additional Author(s):
Hari Katuwal, Post-doctoral researcher, University of Montana
David Calkin, Research Forester, USDA Forest Service, Rocky Mountain Research Station

Wildfire incidents present complex management problems, even for experienced and highly trained management organizations. Each incident may require managers to quickly adapt strategies to existing conditions that present varying degrees of risk for firefighting personnel. This paper explores how managers of highly complex incidents - those requiring Type I or Type II incident management teams (IMTs) - adjust orders for available line-producing capacity in response to changing conditions. We gathered daily observations of suppression resource orders for 299 incidents between 2007 and 2011 where a Type I or Type II IMT was assigned. These orders were linked to at least one of approximately 90 IMTs assigned to the incident and daily fire conditions drawn from ICS-209 reports. A panel-data approach is used to model the amount of resources ordered with fireline-building capability as a function of daily incident conditions, regional differences, and individual IMT effects. Results indicate wide variation in the amount of suppression resources ordered by managers after controlling for observable fire conditions. Significant variation in resource orders exists between different regions and among different IMTs. This research may have implications for suppression cost models, where significant variation in expenditures cannot be attributable to observable geographic and landscape characteristics. The model may also be useful for system-wide decision support activities to identify circumstances where low-cost and low-exposure resource orders are warranted based on fire characteristics, and to assist managers in planning resource needs over the course of an incident.

Keywords: wildfire suppression, incident management teams, fixed effects

Bio: Michael Hand is an economist with the USDA Forest Service, Rocky Mountain Research Station. His research focuses on the tradeoffs associated with wildfire management, risk perception and response to natural hazard incidents, and the economics of climate changes to public lands.

31. Social "Watch Out" Situations for Incident Management Teams

Presenter(s): Toddi Steelman, Executive Director and Professor, School of Environment and Sustainability (University of Saskatchewan)

Additional Author(s):
Branda Nowell, Associate Professor, School of Public and International Affairs, North Carolina State University
Clare FitzGerald, School of Public and International Affairs, North Carolina State University
Mary Clare Hano, School of Public and International Affairs, North Carolina State University

In addition to managing the biophysical aspects of large wildfires, Incident Management Teams (IMTs) must also manage the social aspects of the fire. However, we have a much more sophisticated understanding of the biophysical risks related to wildfire than the social risks. Land cover type, topography, soil moisture, humidity, fuel loads, wind, and weather are common in the vocabulary of most fire managers. We are much less conversant in the language related to risks for problematic communication and coordination among responding agencies and how these risks can be assessed and managed. However, many experienced IMTs implicitly manage for these social or relationship risks during a wildfire. We harvested the experience of 24 highly experienced fire managers, which included US Forest Service and Bureau of Land Management Fire Staff, Fire Chiefs, State Forestry officials, Forest Supervisors, and Sheriffs, all of whom served on

IMTs in different capacities from across the United States (10 states) so that we might more explicitly and systematically understand those risks and share that knowledge. We further worked with Area Commanders, Incident Commanders, and Deputy Incident Commanders to identify and confirm the top most challenging social watch out situations faced by IMTs and the social watch out situations most commonly faced by IMTs. Articulating this list and providing some discussion about these situations and what can be done to effectively manage them could lead to better safety outcomes for IMTs.

Keywords: Social Watch Out Situations, Risk Management, Communication, Incident Management Teams

Bio: Toddi Steelman is Executive Director and Professor, School of Environment and Sustainability (University of Saskatchewan). Her research focuses on improving the governance of environmental and natural resources, emphasizing science, policy, and decision-making interactions. She places special emphasis on the role of the public and community in decision-making. She is Co-director, with Dr. Branda Nowell, of the Fire Chasers project at North Carolina State University (research.cnr.ncsu.edu/blogs/firechasers/).

32. What Cohesive Strategy Looks Like on the Ground

Presenter(s): Katie Lighthall, Coordinator, Western Region, Cohesive Wildland Fire Management Strategy
Steven B. Hawkins – Deputy Fire Staff/Fuels, US Forest Service, Wallowa Whitman National Forest

The National Cohesive Wildland Fire Management Strategy is not a new program but a core philosophy that focuses on collaboration that leads to meaningful progress towards its three goals: Resilient Landscapes, Fire Adapted Communities and Safe & Effective Wildfire Response.

There are many examples of Cohesive Strategy behaviors across the West and this presentation will highlight two, real-life, on-the-ground examples of collaboration leading to success to demonstrate some of the actions stakeholders can take to make progress towards the three goals.

The Western Klamath Restoration Partnership in Orleans, CA is a collaborative group of diverse stakeholders with strong ties to the landscape in northern California. This landscape is ravaged almost yearly by large, devastating and costly wildfires. A long history of mistrust and turbulence between the US Forest Service, the environmental community and local tribes however, has led to project-halting litigation and almost no restoration efforts in the last couple decades. The two-year old collaboration itself is already a giant step in the right direction. The WKRP has moved from agreement in principle with the adoption of six shared values, toward agreement in practice, now considering various treatment prescriptions to set the landscape on a trajectory toward realizing those six values and meeting the three goals of the Cohesive Strategy.

The East Face of the Elkhorn Mountains project is a similar endeavor in northeastern Oregon of federal, state and local agencies to identify, prioritize and treat large landscapes, across multiple jurisdictions including adjacent private lands. The stakeholders and values at risk are different on this landscape than the WKRP example, but the method to achieve consensus and movement toward the three goals is the same.

These real-life examples will be presented to encourage conference participants to ask questions and hear how two efforts are succeeding through a process of collaboration, and what steps participants can take to initiate or improve these efforts in their areas of concern.

Bio: Katie Lighthall – Prior to joining the Cohesive Strategy effort, Katie spent eight years as Program Director for Project Wildfire – a wildland fire mitigation partnership in Deschutes County. There she facilitated and managed seven Community Wildfire Protection Plans, managed a countywide fuels treatment program, secured millions in grant funding and served as PIO and communications director for a variety of fire related programs. Katie Lighthall enjoyed a rewarding career as a management consultant for non profit organizations before her position at Project Wildfire. She she became a structural and wildland firefighter in 1995 with Redmond Fire & Rescue, and later a fire inspector and prevention specialist. Katie holds a BA degree in Political Science and English from the University of Washington.

Steve began his career in 1981 fighting fire for the Burnt Powder Fire Zone, Wallowa-Whitman National Forest in Region 6. In 2008 he moved to his current position as Deputy Fire Staff on the Wallowa-Whitman National Forest. Steve has 33 years of experience working in fire and resource management. Steve is currently on the steering committee for the Blue Mountain Pilot Project of the Cohesive Wildfire Strategy and is the project coordinator on the East Face Project for the Wallowa-Whitman National Forest. Steve received his A.S. in Forest/Range Management from TVCC in 1982 and completed Technical Fire Management thru Colorado State University in 2007.

COLLABORATIVE APPROACHES

33. Building Capacity for Wildfire Mitigation Through Collaborative Partnerships

Presenter(s):
Jerry McAdams, Wildfire Mitigation Coordinator, Boise Fire Department
Julia Kertz-Grant, Former Foothills & Open Space Manager, Boise Parks Department
Jennifer Tomlinson, Park Planner, City of Boise Parks and Recreation Department

Wildfire mitigation efforts should focus on forming partnerships as well as coordinating resources and strategies to create mutually beneficial outcomes in communities. Longer wildfire seasons and increased development in wildland-urban interface (WUI) areas exemplify the need for new and effective wildfire mitigation ventures. It is not uncommon for stakeholders to work on similar types of projects, unbeknownst to one another, creating a duplication of efforts. In a time when agency budgets are shrinking, the need to identify stakeholders and create efficient cooperative partnerships has never been greater. The City of Boise has created an interdepartmental Wildfire Mitigation Team (WMT), comprised of individuals from Fire, Parks, Planning and Public Works. Boise City staff have successfully partnered with federal agencies, not-for-profits, local university research teams, local environmental study groups, volunteer organizations, civic groups, small businesses, developers, as well as homeowners' and neighborhood associations, to organize and manage multiple wildfire mitigation projects, reducing wildfire risk and increasing community awareness. Most recently, the Boise Fire Department has partnered with the Fire Adapted Communities Learning Network, acting as the local hub organization for the Ada County FAC. The City of Boise WMT helped develop and implement a cooperative MOU between the Boise District BLM, the City of Boise, the City of Eagle, Ada County and the Idaho Department of Fish and Game, to address mutual wildfire mitigation concerns and efforts. The City of Boise Wildfire Mitigation Team continues to identify stakeholders and to build new collaborative partnerships.

Keywords: Collaborative Partnerships Wildfire Mitigation Fire Adapted Communities FAC Community Outreach

Bio: Jerry McAdams is the Wildfire Mitigation Coordinator for the Boise Fire Department, where he has worked for 15 years. He serves on City of Boise and Multiagency Wildfire Mitigation Committees. He is a Board Member for the International Association of Wildland Fire and holds an NWCG certification as a Wildland Fire Investigator. Jerry has previously presented at Backyards & Beyond, a Ready, Set, Go! webinar, an Idaho Power luncheon and at the Southwest Idaho Wildfire Mitigation Forum. Jerry has a Bachelor of Science in Psychology from Boise State University. He enjoys working with communities and seeking new, cooperative partnerships.

34. Increasing Capacity for Collaboration by Training Natural Resource Management Agencies, Scientists and Stakeholders

Presenter(s): Susie Kocher

Additional Author(s):
Kim Ingram, Community Education Specialist, University of California Cooperative Extension
Anne Lombardo, Community Education Specialist, University of California Cooperative Extension
Kimberly Rodrigues, Director , UCANR Hopland Research & Extension Center

State and federal agencies are increasingly interested in and committing to managing natural resources through collaboration with other agencies, scientists, and stakeholders. One challenge of this approach is the need for land management agencies to develop the institutional capacity to collaborate with others. This presentation reports on an effort to assist agencies, scientists and stakeholders to increase capacity for collaboration through training in collaboration and facilitation skills by the University of California Cooperative Extension (UCCE).

UCCE became involved in supporting development of collaboration skills as part of the Sierra Nevada Adaptive Management Project (http://snamp.cnr.berkeley.edu), a cross disciplinary study of forest fuels reduction treatments on national forests in the Sierra Nevada of California. The 8-year, 13 million dollar study involved independent third party research by University of California scientists of the integrated effects of forest thinning on fire hazard, forest health, wildlife, water quality and quantity, and public participation.

Public participation and a collaborative process are cornerstones of the multi-agency project. UCCE has engaged in community and stakeholder education and engagement through multiple outreach methods including science meetings with researchers, agencies and public stakeholders; management workshops; presentations to community groups; field trips; and web-based tools for sharing the science of various natural resource fields. These methods allow

for mutual learning, group discussion, information sharing, community involvement in the research process and face-to-face interaction between all parties.

In 2013/2014, UCCE hosted a series of collaboration workshops using a 'train-the-trainer' model with curriculum on process constraints, framing collaborative projects, meeting logistics, group dynamics, understanding interactions, dealing with difficult behaviors and reducing conflict. Over 115 staff from federal and state forestry, fire, wildlife and research agencies, and local conservation organizations have attended.

Participant pre and post-tests quantified changes in knowledge and attitudes as a result of the workshops. Participants reported increased comfort with collaboration and managing a collaborative process by improving communication, sharing information with the public and facilitation when needed. Collaboration training should clarify the roles / responsibilities of agency staff and include facilitation training to bolster understanding of when facilitation is needed and how to conduct it, especially under difficult circumstances.

Keywords: collaboration, training, resource management, extension

Bio: Susie Kocher is a county-based academic who conducts outreach, education and applied research for the University of California Cooperative Extension focusing on forest resilience and wildfire issues, most recently as part of the California Fire Science Consortium. She has done outreach with forest landowner on pre and post wildfire management through in person workshops, webinars and media. She has coordinated public outreach for the Sierra Nevada Adaptive Management Project (http://snamp.berkeley.edu/) for the past seven years.

35. Collaborative Implementation for Ecological Restoration on US Public Lands: Implications for Legal Context, Accountability and Adaptive Management

Presenter(s): Sarah McCafferey, Social Science Researcher, US Forest Service Northern Research Station

Additional Author(s):
William Hale Butler, Assistant Professor, Department of Urban and Regional Planning, Florida State University
Ashley Monroe, Doctoral Candidate, Department of Urban and Regional Planning, Florida State University

The Collaborative Forest Landscape Restoration Program (CFLRP), established in 2009, encourages collaborative landscape scale ecosystem restoration efforts on United States Forest Service (USFS) lands. CFLRP projects must aim to reduce wildland fire management costs, enhance ecological health, and promote the use of small-diameter woody biomass as well as engage in collaboration with multiple stakeholders throughout planning, implementation, and monitoring. The policy has been lauded as an innovative turn in forest management policy due to the focus on landscape scale restoration and requirements for collaboration in all phases of implementing the law. Although USFS employees have experience engaging in collaborative planning, CFLRP requires collaboration in implementation, a domain where little prior experience can be drawn on for guidance. The purpose of this research is to identify the ways in which CFLRP collaborative participants and agency personnel conceptualize how stakeholders can contribute to implementation on landscape scale restoration projects, and to build theory on dynamics of collaborative implementation in environmental management. This research uses a grounded theory methodology to explore collaborative implementation from the perspectives and experiences of participants in landscapes selected as part of the CFLRP in 2010. Interviewees characterized collaborative implementation as encompassing three different types of activities: prioritization, enhancing treatments and multi-party monitoring. The presentation will briefly describe the types of activities in each of these categories and how, within the context of CFLRP, collaborative implementation: 1) is both hindered and enabled overlapping legal mandates; 2) creates opportunities for expanded accountability; and, 3) offers the potential to create more robust feedback loops in adaptive management.

Bio: Sarah M. McCaffrey, Ph.D. is a Research Social Scientist for the USDA Forest Service, Northern Research Station. Her research focuses on the social aspects of fire management. This has included National Fire Plan and Joint Fire Science sponsored projects examining the characteristics of effective communication programs and the social acceptability of prescribed fire, thinning, and defensible space. More recently she has begun work on the social issues that occur during fires including alternatives to evacuation and community-agency interactions during fires.

36. Fires of Change: An Art and Science Collaborative

Presenter(s): Andrea Thode, PhD, Associate Professor, Northern Arizona University

Additional Author(s):
Barbara Satink Wolfson, Program Coordinator, Southwest Fire Science Consortium
Andrea Thode, Associate Professor, Northern Arizona University
Cari Kimball, Program Coordinator, Landscape Conservation Initiative, NAU
Collin Haffey, Ecologist, USGS Jemez Mountains Field Station

The Southwest Fire Science Consortium (SWFSC) has expanded its target audience to include the public and based on the success of a similar project in Alaska, we developed an art and science collaborative called Fires of Change. This is a collaborative project with the SWFSC, the Landscape Conservation Initiative and Flagstaff Arts Council. The goal was to create a stronger link among fire, landscape conservation and climate change; making the newest scientific ideas more accessible to non-science oriented audiences through novel media. Bringing science and art together is not a new concept, but perhaps more important in our current world view, considering the changes we face on a global scale. Artists bring unique perspectives which may lead the public to see science differently. As part of the project, we held multi-day field trips to areas around northern Arizona. We visited the North Rim of the Grand Canyon to learn about their successful fire program and we visited the Slide Fire to learn about the successes in promoting ecologically beneficial fire even during a suppression incident. During the field trips, artists, managers and scientists were all present and contributing to conversation about fire ecology, historical fire regimes, changes in the last century due to human intervention and changes occurring due to a shifting climate. Artists will have a year to produce artwork based on what they learned during the field trips.

Keywords: art, collaboration, fire science, public education

Bio: Andrea E Thode (Andi) is Associate Professor of Fire Ecology and Fire Science in the School of Forestry at Northern Arizona University. Andi completed her B.S. and later her Ph.D. in fire ecology through the Ecology Graduate Group at the University of California, Davis. Her research focuses on fire effects at the local and landscape scale. Andi has been heavily involved in the Association for Fire Ecology (AFE) since its inception as a founding board member, education committee chair and member and through development and planning of several regional and national level conferences. Andi has been the Principal investigator for the Southwest Fire Science Consortium since its inception in 2009.

37. Local Perceptions of Forest Management and Wildfire Risk in Northeastern Oregon

Presenter(s): Angela E. Boag Environmental Studies Program, University of Colorado, Boulder, CO

Additional Author(s):
Joel Hartter, Environmental Studies Program, University of Colorado, Boulder, CO Carsey School of Public Policy, University of New Hampshire, Durham, NH
Forrest R. Stevens, Department of Geography and Geosciences, University of Louisville, Louisville, KY Environmental Studies Program, University of Colorado, Boulder, CO
Lawrence C. Hamilton, Departmennt of Sociology, University of New Hampshire, Durham, NH Carsey School of Public Policy, University of New Hampshire, Durham, NH
Mark J. Ducey, Department of Natural Resources and the Environment, University of New Hampshire, Durham, NH Carsey School of Public Policy, University of New Hampshire, Durham, NH
Michael Palace, Earth Systems Research Center, Institute for the Study of Earth, Oceans and Space, University of New Hampshire, Durham, NH
Nils Chistoffersen, Wallowa Resources in Enterprise, Wallowa County, OR
Paul T. Oester, Oregon State University College of Forestry Extension, LaGrande, OR

Millions of acres of public forestland in the U.S. need treatment and restoration to reduce the risk of catastrophic fire. The ability for federal agencies to treat forests is constrained by limited capacity and funding, and therefore they have sought to develop collaborative partnerships with communities to bolster resources for forest restoration. Since this strategy depends on an informed and engaged public, we conducted telephone surveys during the fire seasons of 2011 and 2014 of residents in the Blue Mountains region of eastern Oregon to understand perceptions of forest health and management. Like many parts of the American West, this region is experiencing demographic change as more people arrive to retire or build second homes; its timber industry has dramatically declined since the early 1990s; and it has

experienced more frequent and larger wildfires in recent years. Our results revealed that residents claim to be informed about declining forest health on public lands and appear more informed in 2014 compared with 2011. In addition, a majority of respondents identified active forest management and prescribed burning on public lands as a high priority. However, only 39% identified commercial logging on national forestland as a high priority, indicating that the public may be less aware of the potential for commercial logging to contribute to restoration activities. There was low support for increasing public land use fees or local taxes to pay for forest restoration, so more creative policy solutions are likely needed to address the forest restoration funding gap. However, a significantly higher proportion of residents in 2014 believe that environmental rules have been good for their area compared with a 2011 survey. Communities may also be becoming more open to regulations and programs that address ecological goals, including a diversity of management actions designed to decrease wildfire risks on both public and private land that traditionally have had little buy-in such as controlled burning. However, the economic hardship faced by land owners and in northeastern Oregon and other rural Western communities means that such policies may also need to include economic development if they are to achieve full local support.

Bio: Angela Boag is a PhD student in the Environmental Studies Program at the University of Colorado Boulder and part of the Communities and Forests in Oregon Project. Her research focuses on the human dimensions of forest management, wildfire risk assessment and mitigation, and species distribution modelling in fire-prone landscapes in the Blue Mountains of eastern Oregon. She received her MS in Forestry from the University of British Columbia where she modeled species distributions of understory plant communities. She has also worked with organizations like the Association of Fish and Wildlife Agencies and the Colorado Coalition of Land Trusts.

DIFFERENT WAYS OF UNDERSTANDING FIRE

38. Radio Technology Opportunities and Constraints: Using Dramaturgy as an Analytic Tool

Presenter(s): Jennifer A. Ziegler, PhD, Associate Professor of Communication , Valparaiso University and Dean of Graduate School and Continuing Education

Additional Author(s):
Rebekah Fox, PhD, Assistant Professor, Texas State University
Elena Gabor, PhD, Assistant Professor, Bradley University
Dave Thomas, Consultant, Renoveling
Anne Black, Program Manager Human Performance Research, Development and Applications USDA Forest Service, Missoula, MT

Radio technology on the fireground has its limitations. While a statement like that is usually followed by comments about about dead spots, weak repeaters, and complicated tone guard programming, this paper and presentation begin with a more positive spin on such "limitations" by focusing on the features of conversation and interaction as they are shaped by technological constraints and cultural adaptation to them. Specifically, radio technology and culture may shape interactive distributed communication such that it is more highly patterned, stylized, and full of deliberate choices (including choices of omission) as compared to other kinds of work related talk on the fireground.

Dramaturgy is an analytic tool that has proved useful for understanding ritualized performances in organizational life (e.g., Rosen, 1985), and conversely, to understand organizing as "performance" more generally. We will report the usefulness of a dramaturgical perspective for helping us understand the nature of radio talk as performance on the fireground with implications for understanding operations, for fire management and culture, and for training. This paper and presentation will review three approaches to dramaturgy: the sociological perspective exemplified by Goffmann's school of impression management (e.g. 1959; 1981) a Burkean rhetorical perspective (1969), and a performance studies perspective (e.g., Schechner, 1988) to assess their potential usefulness for exploring specific questions and issues related to radio communication in fire, and (by the time of the conference) to illustrate the usefulness of the various perspectives by showing what can be gained through analysis of actual data.

Our initial results suggest that the Goffmannesque approach will be valuable for studying the fireground as scene for dramatic "scripted" performances. The Burkean perspective may be more helpful for understanding meanings that emerge for specific interchanges on the radio, in the moment and in retrospect for the people present, but also in subsequent official (and resistant) readings of those behaviors and events. Finally, the more contemporary performance studies approach, with the shaping role of the dramaturg, may prove most useful for training. We use this perspective to ask: As firefighters are taught "how" to perform on the radio, through formal training or informal interaction, what is the implicit dramaturgy of radio performance in wildland fire?

Keywords: Dramaturgy, radio communication, performance

Bio: Jennifer Ziegler, PhD is Associate Professor of Communication at Valparaiso University where she currently serves as Dean of Graduate School and Continuing Education. Throughout the last decade, Dean Ziegler's research has focused solely on communication in the management and practice of safety in wildland firefighting. Her work at the intersection of rhetoric, culture, and communication theory has helped the fire community to understand the history and cultural legacy of bureaucratic rules in accident investigations. She has consulted with agencies initiatives related to improving learning from unwanted outcomes, including highlighting cultural and organizational conditions in fire related work.

39. The Storyteller's Role In Accident Investigations ~ Naturalistic Learning From Unintended Outcomes

Presenter(s): Steve Holdsambeck Firefighter Safety Program Manager, US Forest Service, Intermountain Regional Office, Ogden, Utah

With the evolution of language, 'storytelling' became a primary human instinct. Cognitive scientists tell us humans are hardwired to use stories to place knowledge in context and to share experiences with one another. Educators almost universally exercise storytelling as a fundamental tool for teaching and reasoning. Stories transmit knowledge into wisdom.

Humans crave meaning and require context to understand facts. Lacking the story behind facts (such as a dry factual report that merely lists findings and causes) humans will intuitively place new facts within their own existing personal narratives. Little new learning occurs from new facts, outside of context, other than reinforcing beliefs already held. Learning new lessons from other's experiences requires sharing in their story; taking on a new story.

Creative non-fiction stories are actually more true than factual narratives. Stories (like real life) are multidimensional showing how the characters perceived, understood and felt about the facts. In this way, stories bind facts together to make them make sense. This is truth with a capital 'T'. Moreover, stories can illuminate paradox, a difficult subject to deal with in a factual narrative but ubiquitous to the human condition.

Does 'Storytelling' have a place in a Government's official report of an accident investigation? With the formal adoption of the Facilitated Learning Analysis process in 2014, the United States Forest Service officially endorsed creative non-fiction storytelling for accident investigation reports. This presentation shows that creative non-fiction storytelling is the preferred format and technique for accident investigations as well as other reports where learning from unintended outcomes is desired.

Keywords: Storytelling, Human Cognition, Learning, Risk Perception

Bio: Steve started his Forest Service career as a timber marker on the Talladega National Forest. After graduation from Auburn University, Steve worked positions in Silviculture, Timber Sales Administration, Law Enforcement, Recreation Program Manager, Fire Management Officer and District Ranger in Forest Service Region's 2, 4, 8 and 9. Steve has participated on, or led, unintended outcome learning reviews across the country including seven fatality investigations/ FLA/CRPs and over thirty non-fatality FLAs.

Steve authored the first "Peer Review" Guide in 2007, then later the Accident Prevention Analysis "APA" Guide and then every edition of the Facilitated Learning Analysis "FLA" Guide from 2008 through 2014. Steve has taught or lectured on Just Culture, High Reliability Organizing, Storytelling and Accident Investigations across the country for the past twelve years.

40. Australian volunteer rural fire brigades: the value of historical perspective

Presenter(s): Sandra Lauer, PhD scholar, Department of Sociology , Australian National University

Wildfire has shaped much of Australia's ecological landscape and is a fundamental part of those ecological processes. However, fire has not only changed the ecological landscape in Australia. It has also shaped how Australians think of themselves as a people. Every local community has its own memories of fire; stories of survival, disaster and heroism. Some of these events, such as the 1939 Black Friday fires, the 2009 Black Saturday fires in Victoria and the 2003 Canberra Firestorm, are etched in the story of the nation. Other smaller, localised bushfire events also have long lasting impacts on local communities, even if they are relatively unknown elsewhere.

Understanding historical events as trigger points and analysing supporting historical documents, personal stories,

narratives and photos provides an opportunity to unpack "wicked problems" that are often seen as being unsolvable. The professionalisation of fire management is one such "wicked problem" that has emerged as being a catalyst for disharmony.

Volunteer rural fire brigades are an essential part of these local and national historical narratives about fire and their histories are a valuable means of understanding how fire regimes and responses to fire have changes over time.

This paper will present preliminary research findings on the changing functions of such volunteer rural fire brigades in the Monaro region, New South Wales. The paper will explore how such an in-depth historical analysis enriches the development and understanding of some of the key research questions being asked. In this way, the paper argues that historical analysis is an important method for providing context for fire-related research but also sheds new light on current "wicked problems", such as the professionalisation of fire management, that have evolved in response to complex local, national and international pressures.

The paper also suggests that historical analysis can then help inform future fire management strategies within New South Wales and Australia, within the broader context of national policy changes.

Keywords: volunteer rural fire brigades, Australia, New South Wales, Monaro, history, narrative, bushfire, wildfire, case study, sociology, fire management

Bio: Sandra is a PhD scholar in the Department of Sociology at the Australian National University. She completed her Masters degree in Geographical Sciences in 2010. Sandra is also an active volunteer firefighter in the NSW Rural Fire Service.

41. Making Every Word Count: Teaching Wildland Fire in the Brazilian Amazon

Presenter(s): Matthew Carroll, Smokejumper/Spotter at the McCall Smokejumper base

Additional Author(s):
Robert Morrow
Forrest Behm
Jayleen Vera
Jason Lawhon

In 2009 the US Forest Service International Programs (IP) was asked to supply subject matter experts (SME) in wildland firefighting to train a group of ranch workers, settlers and indigenous peoples in Mato Grosso State, Brazil. The groups requesting training were already engaged in fire suppression on complex, rapidly moving, grass and forest fires and were asking for help in improving their efforts. The SMEs who filled the request faced a sizable, but probably not unique, challenge: Design a training that can be accomplished in 4 to 5 days through a translator (and sometimes double translators) to a group with a broad range of social, educational, cultural backgrounds and there is no expectation that any of the participants will ever take another training in wildlland firefighting.

The group of SMEs working in Brazil framed the training around becoming more effective and safe, where everything taught throughout the course could be tied back to one or both of these foundational elements. They developed training tools such as the concept of moving from being lucky to being good, which introduced ideas of risk and error tollerant systems. A "mental toolbox" where concepts like situational awareness, LCES and the 10&18 could be figuratively placed, allowing the SMEs to link the physical firefighting tools with the mental ones and emphasizing the importance of a mental toolset. These few examples illustrate the attempt to distill multiple NWCG classes into a single training that would have the best chance at making the participants more effective and safe.

This session begins with a brief overview of the evolution of the training courses from 2009 through November 2014, highlighting the trade-offs, lessons learned, epiphanies and failures throughout that time. The session hopes to conclude with a discussion on how we can begin to capitalize on the collective lessons learned so that the next group tasked with such a challenge can build off the knowledge of others.

Keywords: Safety, Effectiveness, Teaching, Brazil, Organizational Learning

Bio: Matt Carroll is currently a Smokejumper/Spotter at the McCall Smokejumper base and has been a wildland firefighter since 2000. He has been detailed into the Human Factors Specialist position at the US Forest Service Office of Learning (OOL) since January of 2014. Matt's work with the OOL began with the creation of the Margin video to bring the concept to the field. He has also been working on accident/incident reporting systems, risk assessment and management, Individual and organizational learning and resilience.

42. Optimal Forest Management: A Dynamic Analysis to Promote Healthy Forests and Economic Development

Presenter(s): Kara, Walter, PhD Candidate, University of New Mexico

The frequency, size, and impact of wildfires grows more every year and with droughts in many parts of the country, the risk of wildfires is also increasing. Following policy changes that made forest treatments easier, the number of treatments has increased especially in the Wildland-Urban Interface (WUI). With this change in procedure, researchers began to develop models to analyze the relationship of forest management and wildfire risk. This research develops a dynamic optimal control model to analyze the relationship between forest health and treatments. This research contributes to the existing literature by considering two different treatments that have yet to be examined together: prescribed burning and mechanical thinning. In addition, it will include both ecological and environmental variables; this will allow forest managers to consider both the ecological health and economic health of people living in the area. Finally, the model will consider a different objective function, which will maximize the net benefits of forest change with forest health subject to the economic, ecological, and financial constraints. Results will show the optimal time path and trade-offs for different treatments and their effects.

Bio: Kara Walter is a 4th year Ph.D. Candidate studying economics at the University of New Mexico. She is an applied microeconomist particularly interested in natural resource economics and ecological economics. Her research focuses around wildfires and how they interact with the economy and human populations. She earned her MA in economics from UNM in 2013 and a BA in economics and finance from University of Southern Indiana in 2011.

MODELS AND METHODS OF SAFETY

43. Suppression of forest fires by the drop water flows interspaced in time and space

Presenter(s): Pavel A. Strizhak, National Research Tomsk Polytechnic University

Additional Author(s):
Zhdanova Alena Olegovna, postgraduate, professor
Kuznetsov Geniy Vladimirovich, doctor of physical and mathematical sciences
Strizhak Pavel Aleksandrovich, doctor of physical and mathematical sciences, professor

Experimental results of drop water flows evaporation when moving through the high-temperature gases (combustion products of typical liquid fuels) are presented in the paper. Experiments were made with application of the panoramic optical noncontact methods of "tracer" visualization (PIV, IPI, PTV, PLIF). Characteristics of evaporation and influence of the dimensions, moving velocities and concentration of droplets in a flow on its were found. Regularities with braking of droplets in the flame area, change of characteristic forms, collisions, coagulation and crushing were revealed. Physical and mathematical models of the movement of droplets through the flames were developed on the basis of experimental data. The numerical values of droplets existence times in the flames of different height when moving of droplets with different velocity and distances between its were found. The model allowing defining the demanded concentration of droplets, its sizes and motion velocities, at which predetermined temperature decrease in the flame zone and concentration of combustion products and an oxidizing agent are possible, was developed. The simulation of flaming combustion suppression and thermal decomposition of typical forest combustible materials (birch leaves, pine and fir-tree needles) vapor-droplet water flows was performed. The model allowing describing the processes of heat transfer under the full evaporation of water droplets in a flame and generation of only water vapors at the surface of FFM is developed. The demanded temperatures of vapor-gas mix and thickness of FFM corresponding to conditions of FFM decomposition reaction suppression were found. The system describing the heat transfer conditions under the liquid film evaporation on the boundary with thermally decaying FFM was also considered. The minimal thickness of a liquid film, at which temperature in FFM is lower than temperature of thermal decomposition, was found. Results of numerical system simulation (in which the processes of heat transfer when forming of heterogeneous system (water with solid inclusions) between the layer of forest combustible material and the trace of water massif are considered) were presented. It was found that the possible increase of "buffer layer" concerning 0,005 m doesn't practically influence on FFM cooling conditions. The system model which describes the processes of heat transfer under the definite distance between extinguishing liquid droplets on the surface of intensively pyrolyzing FFM was developed. It was found that heat of phase transformation under the evaporation of two "neighboring" water droplets is sufficient for the energy absorption accumulated in a heated-up layer of FFM. The model which allows considering the process of heat transfer during the passing of all water in the pores of a near-surface layer of FFM and also the formation of a water film over FFM layer filled with water was developed. It was found that the velocities of chemical reaction in this area are inertially

decreased owing to the cooling of adjoining, filled with water FFM layers.
The reported study was supported by the Russian Science Foundation
(Project No. 14-39-00003).

Keywords: flames, suppression, drop water flows, simulation, experiment, panoramic optical method

Bio: Doctor of physical and mathematical sciences, professor, National Research Tomsk Polytechnic University

44. A Proposed Experimental Methodology for Assessing the Effects of Water and Dry Matter Content on Live Fuel Flammability

Presenter(s): Oleg Melnik, Graduate student, Department of Renewable Resources, University of Alberta

Additional Author(s):
Stephen Paskaluk, Research Engineer, Department of Human Ecology, University of Alberta
Mike Flannigan, Professor, Department of Renewable Resources, University of Alberta
Mark Ackerman, Adjunct Professor, Department of Mechanical Engineering, University of Alberta

Fire management effectiveness and safety of firefighters strongly depend on accurate predictions of fire behavior. To ensure the reliability of predictions, a fire modeling system needs a valid numerical input for flammability not only of dead fuel, but also of live fuel. The objective of this study is to evaluate the effects of water and dry matter content on energy release rates, aiming to develop an approach for quantifying live fuel flammability.

In this study we defined and measured flammability of live fuel as a response of live fuel to the conditions of frontal fire. These conditions were experimentally simulated using flame of a 100×100-mm calibrated open methane burner placed underneath a 100×100-mm sample of new, 1-year, and 2+ years old shoots of white spruce (Picea glauca). Heat release rate and effective heat of combustion during the first 60 seconds of combustion (average frontal fire residence time) were measured using oxygen-consumption calorimetry. Flammability of the sample was evaluated as its contribution to the incoming methane flame and calculated as effective heat of combustion of the methane flame with the burning sample within the flame minus effective heat of combustion of the methane flame alone.

Water content of 1-year and 2+ years old shoots caused notable decrease in shoot flammability. For new shoots with water content over 180% calculated net energy release was negative, meaning a reduction in the energy release rate for the methane flame. High water content and substantial losses of energy for water evaporation caused increased time-to-ignition and reduction in the reaction temperature of both the methane flame and the flame of the sample. According to these results, new shoots actually suppress incoming flame of the approaching forest fire. The effects of dry matter content and density on shoot combustion characteristics are currently under investigation and will also be reported. The conditions of frontal fire are much better represented in the proposed experimental method than in the existing techniques, thus providing more realistic estimation of live fuel energy contribution to the frontal fire intensity. Further development of the proposed experimental methodology will allow quantification and prediction of the flammability of live fuels and eventually inclusion of this important variable in the fire modeling process.

Keywords: firefighters safety, fire behavior prediction, live fuel flammability, water content, dry matter content, oxygen consumption calorimetry, heat release rate, effective heat of combustion

Bio: Oleg Melnik graduated from the Ukrainian State University of Forestry and Wood Technology with BSc in Forestry in 1984. He acquired 15-years of experience in operational forest firefighting while working for the Ministry of Forestry of Belarus holding a position of a Divisional State Forest Protection Officer. Currently he is a Master Student in Forest Biology and Management with the University of Alberta conducting research on flammability of live fuel. He is a participant of the Western Partnership for Wildland Fire Science and a member of the Canadian Remote Sensing Society, Canadian Aeronautics and Space Institute, and International Association of Wildland Fire.

45. Interacting with Wildfire Simulations and Historical Wildfire Analysis

Presenter(s): James R. Gattiker

Additional Author(s):
Stephen Guerin, CEO simTable.com

Public outreach, planning, and training benefit from the innovative use of historical wildfire behavior datasets and real-time interaction with wildfire models. The presentation of relevant wildfire historical datasets helps to guide discussions about wildfire characteristics in the context of chosen scenarios. The real-time interaction with wildfire models facilitates

discussions of mitigation of wildfire threats, firefighter responses, and emergency management including evacuations and smoke impacts. This talk will discuss experiences using Simtable in these contexts, and how the quantitative use of historical datasets as well as real-time wildfire models adds value to the interactions.

Historical wildfire records are used to derive empirical characteristics that help to understand the nature of future fires, with analysis methods including machine learning, spatial modeling, clustering, and agent-based modeling approaches. The analysis of historical wildfires leads to improved understanding of wildfire behavior, better models of wildfire spread, and can suggest refined indicators of potential fire hazard and mitigation strategies. Training simulations use the historical data to ensure that the relevant breadth of wildfire behavior is incorporated. Similar previous fire events can be recalled during fire situation assessment, in both training and operational modes, to provide qualitative guidance on possible fire behavior.

Simple fire progression spatial models are use to provide a continuous fire progression exactly consistent with historical perimeters. Semi-empirical models of fire progression allow simulations that can be operated interactively in real time, facilitating the exploration of wildfire behavior for training and outreach. These models can be tuned on the discovered historical properties to assess likely fire progression. There is an inherent high uncertainty in many aspects of wildfire assessment and projection due to inherent limitations in dataset detail (e.g., relevant meteorology at tens of meters) and in the limitations phenomenological models suitable for fast user interaction. When using wildfire models, the historical data are a potential resource for tuning model parameters and analyzing the limits of model predictions.

Keywords: wildfire data analysis, wildfire modeling, public outreach and education, wildfire management training

Bio: Dr. Gattiker has been a staff member at Los Alamos National Laboratory for over 20 years, working on data analysis and statistical modeling in a variety of application areas related to scientific advancement and national security, including applications in climate and environment. He has recently been working on applied data analysis with simTable, developing enabling views of historical wildfire data for wildfire understanding, supporting modeling and situation awareness.

46. Wildland Firefighter Safety and Fire Behavior Prediction in the Field

Presenter(s): Marty Alexander

Additional Author(s):
Wesley G. Page, Fuels Tech, USDA Forest Service

A whole host of firefighter safety guidelines have gradually emerged over the years starting with the Ten Standard Fire Fighting Orders in 1957. Similarly, many advances in fire behavior research and fire behavior training have taken place. The Yarnell Hill Fire tragedy of June 30, 2013 involving the Granite Mountain Interagency Hotshot Crew (GMIHC) represents the latest in a long list of wildland firefighter fatalities on a global basis as a result of a burn-over or entrapment. While the issue is multi-faceted, it does beg the general question: Have we in wildland fire administration, training and research somehow failed firefighters?

According to the Serious Accident Investigation Report on the Yarnell Hill Fire, the flame front in the vicinity of the GMIHC entrapment area/deployment site advanced at a rate of ~16-19 km/h with flame lengths of ~18-24 m. This in turn raises a number of specific questions:

- Was this level of fire behavior predictable given the fire weather forecast products available at the time and the current set of fire behavior guides recommended for fireline personnel?
- How often, if at all, are current fire behavior guides utilized by field going personnel, and if they are not used, why?
- Did the GMIHC attempt to make a prediction of potential fire behavior (i.e., rate of fire spread and flame length) before leaving the safety of the "black" sometime after 1604 hours?
- If the GMIHC did in fact attempt to make predictions of potential fire behavior, did they also calculate their "margin of safety" as per Mark Beighley (1995. Fire Management Notes 55(4): 21-24.) based on their assumed rate of travel and the fire's expected rate of advance?

We will never know the answers to the latter two questions raised above but perhaps it is time that we find out what is actually going on in the field. This paper examines directly the first two questions and also surveys, on a global basis, the current status of field guides and aids to predicting fire behavior at the individual crew level. Recommendations for further study are offered.

Keywords: fire behavior, margin of safety, fatal firefighter entrapments and burnovers

Bio: Marty Alexander began his career in wildland fire in 1972, serving on the Bighorn inter-regional hotshot crew for two seasons. He retired in November 2010 as a Senior Fire Behavior Research Officer with the Canadian Forest Service in Edmonton, Alberta, after nearly 35 years service. He is presently an Adjunct Professor of wildland fire science and management at the University of Alberta. His research/technology transfer efforts have focused on applications of fire behavior knowledge and is considered an authority on the Canadian Forest Fire Danger Rating System. In 2003, Marty received the IAWF International Wildland Fire Safety Award.

DECISION MAKING AND FIRE

47. The Protective Action Decison Model: It's Application in an Australian Bushfire Context

Presenter(s): Ken Strahan, Managing Director, Strahan Research

Lindell and Perry's Protective Action Decision Model (PADM) is a judgement and decision making model which has been extensively used to analyse the behaviour and decision making of people subject to potential and actual threat from a wide range of natural hazards, especially in the USA.
Although the PADM has been used in a limited way in a small number of wildfire studies in North America this has not been the case for studies of bushfire in Australia. This presentation addresses two questions. (1) Does the PADM require adjustment or refining for use in studies on individual and household decision making in a wildfire/bushfire context? (2) How might the Australian policy of "Prepare Act Survive" (PAS) which emphasises the dangers of staying and defending during extreme fire weather conditions and promoting leaving early as the safer option, influence the application of the PADM?

The presentation will discuss differences between wildfire/bushfire and other natural hazards and how these differences may affect the application and interpretation of the PADM. The greater complexity of decision-making that can result from the PAS policy impacts some of the core aspects of the PADM.
Specifically the presentation will discuss three key issues for the model in the context of bushfire in Australia:

(1) Reduced importance of threat perceptions and (2) the increased importance of stakeholder perceptions in the decision -making process. (3) Greater complexity of the protective action decision-making process especially in identifying, comparing selecting and timing the implementation of the protective action.

These three issues are extremely significant to the PADM. First, threat and stakeholder perceptions are two of the three elements which Lindell, the co-creator of the PADM has identified as its "core". Second, the protective action decision making process, which is served by the information search process, is the decision-making engine of the PADM which produces an appropriate protective response. Better understanding these issues in the context of Australian bushfire will help to refine and perhaps extend the PADM.

Keywords: PADM, wildfire, bushfire, choice, decison making

Bio: Ken Strahan is the Managing Director of Strahan Research and has been involved in emergency management research, primarily in relation to bushfire in Australia, for 22 years. He has provided social research services to a number of agencies including the Country Fire Authority (Victoria), Country Fire Service (South Australia), Office of Emergency Services Commissioner (Victoria) and the Department of Premier and Cabinet (New South Wales).
Ken is also a PhD candidate at the RMIT University researching self-evacuation decision-making in a bushfire event in Australia.

48. Connecting Science and Decision-Making in Wildland Fire Management

Presenter(s): Melanie Colavito, School of Geography and Development at the University of Arizona

Climate change has already had significant impacts on fire regimes in the United States and these impacts are expected to intensity throughout the coming century. Decision-making, management action, and scientific research that focus on ways to increase both ecological and social resilience to changing disturbance regimes are therefore becoming increasingly important. At the same time, there are ongoing calls for more useful scientific information to inform decision-making and management action, especially within the context of climate change. Nonetheless, effectively connecting science, decision-making, and management action remains a challenge for numerous reasons. This study seeks to address this challenge by investigating the most effective ways to develop and apply scientific information about resilience for decision-making and on-the-ground management. This presentation will describe the results of interviews that were conducted with scientists, managers, and other stakeholders immediately following a workshop that focused on ways to better understand and foster ecosystem resilience under rapidly changing conditions in the Southwest U.S. This study found that scientific

information is being used in a variety of ways in land management, from formally in planning documents to informally in the field. Nonetheless, there are still many obstacles to using scientific information effectively or developing studies to directly address management questions due to institutional requirements and limitations for managers and scientists alike. Two distinct types of scientific information needs are identified, including the need for new research and the need for more effective communication of existing information and research, each with its own pathway for informing decision-making and management action. Additionally, both verbal and written approaches for communicating scientific information are compared and assessed. The presentation will conclude with a list recommendations for effectively developing and applying scientific information about resilience for on-the-ground management. The results of this research can be used to improve our understanding of the human dimensions of fire management, specifically with respect to disseminating and applying science for decision-making under rapidly changing environmental conditions.

Keywords: decision-making, usable science, fire management, resilience, climate change

Bio: Melanie Colavito is a PhD candidate in the School of Geography and Development at the University of Arizona. Melanie's research focuses on the roles of science and collaboration in decision-making for forest restoration and fire management in the Western U.S. Her main objective is to design her research to answer pertinent scientific and management questions, as well as to share her results in a range of formats to appeal to different audiences. Melanie also has a minor in Remote Sensing and Spatial Analysis, as well as graduate certificates in Geographic Information Systems and College Teaching. She will graduate in 2015.

49. Power and Decision Making: A Foucaultian Analysis of Wildland Decision Making

Presenter(s): Van V. Miller, professor , Central Michigan University

If the conference theme "Managing Fire, Understanding Ourselves: Human Dimensions in Safety and Wildland Fire" truly aims at understanding ourselves, then we participants must engage intellectually with the concept of power, i.e. broadly defined as the ability to influence decision making (Dahl, 1957 and Foucault, 1982). To undertake an analysis of WF decision making, a method better known in the social sciences than in the physical sciences will be utilized. Foucaultian analysis seems highly appropriate for this task because of its detailed interest in the 'problem itself' and of an established methodology for investigating the designated problem.

The nexus between WF decision making and outcomes (operationalized as decisions, actions, and results) represents the central concern of this proposed paper and can be readily examined with the Foucaultian method at three levels of analysis—policy, IC, and crew. In line with the method, the problem will be specified through this question: With over a century of professionalized wildland firefighting in the United States, why do we still observe major conflicts about WF practices and outcomes? To address this problem using Foucaultian analysis, the question will be explored via the archaeology-genealogy-discourse framework that it espouses (Kendall and Wickham, 1999).

Finally, suggested refinements to WF decision making will be offered for each of the analytical levels studied. In keeping with the Foucaultian method and its mandated skepticism, the problem facing WF decision making should be viewed as a series of contingencies where a particular choice resulted in a path of actions with results that would not have been realized had another contingency choice been selected. To clarify contingency choices and paths of actions in greater detail, the current and conflicted notion of the WUI (wildland urban interface) as a negative WF risk factor will be discussed in considerable detail.

Keywords: Power Risk Decision Making

Bio: Van V. Miller is a professor at Central Michigan University and does research on wildland fire and sustainable development. He holds a Type 2 wildland firefighter certificate and is an active member in the Brazos Canyon Volunteer Fire Department.

50. Nudging Wildfire Managers – Taking Advantage of Behavioral Economics in Decision Support and Performance Management

Presenter(s): Dave Calkin, PhD, Research Forester, USDA Forest Service, Rocky Mountain Research Station

Additional Author(s):
Michael Hand, Research Economist, USDA Forest Service Rocky Mountain Research Station
Matthew Thompson, Research Forester, USDA Forest Service Rocky Mountain Research Station

Decision making in wildfire management is characterized by high levels of uncertainty, both in terms of environmental conditions and human factors. Behavioral economics and decision science research has established several decision making errors and biases when humans are confronted with high levels of uncertainty that result in sub-optimal outcomes as compared to economically efficient solutions. Wildfire specific research has demonstrated that wildfire managers are subject to many of these well-established biases and errors (see for example Wilson et al., 2011, Calkin et al. 2013, and Hand et al. forthcoming). Thaler and Sunstein in their book, Nudge, suggest that government programs use choice architecture to alter people's decisions and behaviors in predictable ways to improve outcomes associated with uncertain decisions. Although wildfire decision support systems have made advances in presenting managers with risk information, the potential use of choice architecture in wildfire management scenarios has not yet been explored. In this presentation we will discuss the nature of identified decision biases within wildfire management, their expected impact on efficient wildfire management, and identify the potential for the application of choice architecture to improve wildfire management outcomes.

Keywords: Decision biases, choice architecture, decision support

Bio: Dave Calkin is a Research Forester in Human Dimensions Program at the US Forest Service Rocky Mountain Research Station in Missoula, Montana, USA. Dave is the team lead of the Fire Economics group of National Fire Decision Support Center, a joint agreement between Fire and Aviation Management and Research intended to improve risk based fire management decision making through improved science application and delivery. Dave's research incorporates economics with risk and decision sciences to explore ways to evaluate and improve the efficiency and effectiveness of wildfire management programs.

EVACUATION AND SHELTERING

51. Do I stay or do I go? The role of risk tolerance in evacuation decisions during a wildfire event

Presenter(s): Sarah McCaffrey, Research Forester, USDA Forest Service Northern Research Station

Additional Author(s):
Avishek Konar, PhD Candidate, Ohio State
Robyn, Wilson, PhD, Associate Professor, Ohio State

Most socio-psychological wildfire research focuses on risk mitigation actions taken before a fire event occurs with less attention paid to homeowner actions during a fire. However, increasing incidences of homeowners refusing to evacuate or leaving at the last minute during wildfires and other natural disasters had led to a growing interest in research into evacuation decision making. We randomly selected homeowners from three counties in the states of Washington, Texas and South Carolina, and conducted a mailed survey to assess their evacuation decision making process in the spring of 2013. These three counties were specifically chosen because of their high wildfire risk, but they each varied in terms of past experience with wildfire and mandatory evacuation orders. Drawing on Protection Motivation Theory and the Extended Parallel Process Model, we assessed individual homeowner's threat and coping appraisal related to wildfire, as well as individual risk attitudes. We found that individuals are less likely to stay and defend when the perceived benefits of evacuation are high, and perceived efficacy for staying is low. We also found that those who evacuate pay more attention to official decision cues (e.g., being asked to evacuate by a safety official) as opposed to social or physical cues. In general, those who stay and defend are more risk tolerant and perceive greater control over wildfire. To ensure maximum public safety, crisis communication efforts should focus on the benefits of evacuating early. In addition, efforts should be made to ensure that those who are likely to stay and defend are justified in their personal belief that they can do so safely.

Keywords: risk tolerance, evacuation decision, risk communication, risk perception

Bio: Sarah M. McCaffrey, Ph.D. is a Research Social Scientist for the USDA Forest Service, Northern Research Station. Her research focuses on the social aspects of fire management. This has included National Fire Plan and Joint Fire Science sponsored projects examining the characteristics of effective communication programs and the social acceptability of prescribed fire, thinning, and defensible space. More recently she has begun work on the social issues that occur during fires including alternatives to evacuation and community-agency interactions during fires.

52. Sheltering practices during bushfires: lessons from the 2009 Black Saturday fires

Presenter(s): Joshua Whittaker, PhD, Research Fellow, RMIT University and Bushfire & Natural Hazards CRC

Additional Author(s):
Raphaele Blanchi, PhD, CSIRO Land & Water
Justin Leonard, CSIRO Land & Water
Kimberley Opie, CSIRO Land & Water
Katharine Haynes, PhD, RIsk Frontiers, Macquarie University

On Saturday 7 February 2009, 173 people lost their lives and more than 2000 houses were destroyed in bushfires (or wildfires) in the Australian State of Victoria. Residents had been advised to prepare to stay and defend their homes and properties against bushfire, or to prepare and leave well before a fire arrived in their area. This advice, known as the 'Prepare, stay and defend or leave early' policy, was based on evidence that well-prepared residents can protect houses from bushfires, and that a large number of deaths have occurred during late evacuations. However, on Black Saturday, 118 people died inside houses or other structures. A Royal Commission into the fires found that the binary approach of 'stay and defend or leave early' did not reflect the reality of what people do during bushfires. It recommended the development of a comprehensive bushfire policy that provides for 'more options and different advice'. In particular, it was suggested that community refuges and personal bushfire shelters be considered as a backup in the event that residents were unable to safely leave or defend their property. In response, most fire services have begun to establish local community refuges, and the Australian Building Codes Board (2010) has developed the 'Performance standard for private bushfire shelters'. Public interest in sheltering is growing.

This paper presents key findings from a study of sheltering practices during the 2009 Black Saturday fires. Based on an analysis of interviews with survivors and life and house loss data, it examines the circumstances and challenges experienced by residents when sheltering. Key factors that influence sheltering outcomes include: the knowledge, preparedness and actions of residents; exposure to heat, fire and smoke; and the type and vulnerability of the shelter. The paper concludes by considering the implications of the research for bushfire safety policy and community education.

Keywords: Bushfire; wildfire; community safety; sheltering; preparedness

Bio: Josh is a Research Fellow in the Centre for Risk & Community Safety at RMIT University and is affiliated with the Bushfire & Natural Hazards Cooperative Research Centre. He has undertaken a range of research projects on the human dimensions of wildland fire and was a member of the Bushfire CRC's Black Saturday research taskforce.

53. Establishing wildfire evacuation zones—a coupled human-environment system approach

Presenter(s): Dapeng Li, Department of Geography, University of Utah

Additional Author(s):
Thomas J. Cova, Professor of Geography, the Department of Geography, University of Utah
Philip E. Dennison, Professor of Geography, the Department of Geography, University of Utah

Wildfires are a common hazard in the western U.S. due to fuel accumulation and seasonal drought and cause significant losses of life and property every year. With the rapid population growth in the wildland urban interface (WUI), public safety in fire-prone WUI areas has attracted significant research interests in the past few years. Wildfire evacuation zones are used by incident commanders (ICs) to divide the risk area into several zones so as to facilitate staged evacuation. The ICs need to take into account both fire progression and threatened population before they can delineate evacuation zones using prominent geographic features based on their experience. Wildfire evacuation triggers are prominent geographic features (eg., ridges, roads, and rivers) utilized in wildfire evacuation and suppression practices, and when the fire crosses these features, an evacuation will be recommended for the communities or firefighters in the path of the fire. Recent studies of triggers have used Geographic Information Systems (GIS) and wildfire spread modeling to calculate evacuation trigger buffers around a location (P) with a given time (T) as the input. Trigger modeling has been formulated into a Wildland Urban Interface Evacuation (WUIVAC) model. From the system modeling perspective, wildfire spread is an environment system, while the evacuation of threatened population is a human system. This work examines how to couple wildfire simulation and trigger modeling to establish evacuation

zones by using a coupled human-environment system approach. The proposed coupling approach takes into account the coupling of fire simulation and evacuation modeling at the data, model, and knowledge level. The proposed evacuation zone establishment method consists of three steps: 1) trigger modeling is used to calculate trigger buffers for each household; 2) fire spread simulations are performed to trigger the evacuation of all households and derive the recommended evacuation departure times (REDTs); 3) the households are aggregated and grouped into evacuation zones based on their REDTs and their spatial locations, which will enable the ICs to develop a staged evacuation plan. This method uses GIS to model the process in which a spreading fire triggers the evacuation of a set of households based on their trigger buffers. In the end, a case study of Julian, California is used to test the effectiveness of the proposed method, and the results reveal that the proposed method is effective and can be used for household-level staged evacuation planning.

Keywords: wildfire evacuation zones, triggers, wildfire simulation, coupled human-environment system

Bio: Dapeng Li is a PhD student in the Department of Geography at the University of Utah. He earned his Bachelor's degree in Geographic Information Systems (GIS) from China University of Geosciences and his Master's degree in Cartography and GIS from Peking University. His research interests include wildfire evacuation modeling and GIS. His dissertation focuses on modeling wildfire evacuation as a coupled human-environment system.

PEOPLE, CLIMATE AND LANDSCAPES
54. Spatial allocation of landscape values

Presenter(s): José J. Sánchez, PhD, Research Statistician, Forest Service PSW Research Station

Additional Author(s):
Ken Baerenklau, PhD, Associate Professor, University of California, Riverside
Armando González-Cabán, PhD, Research Economist, Forest Service, PSW Research Station

We used a stated-choice experiment method to estimate landscape values of the San Jacinto Wilderness in southern California. The analysis utilizes survey data from backcountry visitors who responded to questions about recreation behavior (i.e., number of trips taken in the past 12 months to each trailhead, distance traveled, etc.). We developed a GIS data layer containing non-market values derived from a Kuhn-Tucker demand model. Each pixel in the data layer contains an estimate of the recreation values at that location. The spatial elements in the regression allow us to estimate how the aggregate trailhead values and welfare effects are derived from the different parcels that comprise a trail's viewshed. Together, these two steps enable estimation of the value of recreation benefits derived from experiencing different parts of the landscape.

Using GIS viewshed tool and the estimated recreation values, maps were developed containing values for a 30x30 meters parcel. On a per hectare basis, aggregate annual values range from .01 cents to $4,224.25/ha throughout the wilderness, with a mean of $123.86/ha. The highest values are located in the highest elevations at San Jacinto and Tahquitz Peaks and the most frequently visited sites: Devil's Slide and Long Valley trailheads. Because our spatial allocation method is based on visibility, these parcels received higher visibility weights and thus contribute more to the value of a trip. Therefore, parcels that are both highly visible and frequently viewed receive the highest values. In contrast, parcels located in relatively remote areas and away from trails in our study have lower and sometimes no recreation value because of their limited visibility and/or low visitation rates (or having no data on the particular trailhead). However, this does not mean that those areas do not have economic values; rather we did not have any information to calculate these other values.

Keywords: GIS; Kuhn-Tucker demand system model;Nonmarket valuation; Recreation

Bio: Dr. José Sánchez recently graduated (June 2014) from University of California, Riverside with a PhD in Environmental Sciences. Dr. Sánchez is currently working with USDA Forest Service Pacific Southwest Research Station as a Research Statistician. His research focuses on nonmarket valuation of ecosystem services and evaluating the economic impact of wildfires on natural resources.
He has a master's degree in Statistics from Washington State University and a bachelor's degree in Economics from the University of California, Irvine.

55. People's Perceptions of Post-Wildfire Landscape Recovery

Presenter(s): Chad Kooistra

Additional Author(s):
Dr. Troy E. Hall, Professor and Department Head, Forest Ecosystems and Society Department, Oregon State University
Dr. Travis Paveglio, Assistant Professor, Conservation Social Sciences Department, University of Idaho

Considering the increasing potential for widespread forest disturbances, it is important to understand the implications of landscape changes, and perceptions of changes, on people's responses to forest disturbances. Understanding how people perceive landscape change over time following forest disturbances helps researchers, land managers, and community leaders identify important biophysical and social characteristics that influence their responses to those disturbances. This presentation describes people's perceptions of landscape recovery following a significant wildfire. The lightning-ignited Dahl fire burned 12 miles southeast of Roundup, MT in June 2012. The fire burned approximately 22,000 acres and destroyed 73 residences. We conducted interviews in the summers of 2013 and 2014 with more than 50 residents, land managers, emergency personnel, and other stakeholders. While interviews covered several topics, this presentation focuses on responses to questions regarding perceptions of post-fire landscape recovery. Interviews revealed that people's understanding of the role of wildfires as a natural ecosystem process (i.e., their mental models), as well as their connections with the landscape, were important factors that influenced their perceptions of post-fire landscape recovery. Many respondents referenced previous wildfires in the area by explaining how parts of the landscape affected by the Dahl fire might compare to certain areas of the previous fires. Participants with a stronger understanding of the ecological role of fire seemed less concerned about the long-term negative impacts of the fire on the ecological and aesthetic aspects of the changed landscape. Also, participants who identified with a more utilitarian connection to the landscape (e.g., ranchers) tended to have more positive outlooks on wildfires, and landscape recovery, than those participants who expressed connections to the landscape based on other reasons, like aesthetics and privacy. We will discuss people's perceptions of landscape recovery, including the roles of people's mental models and their connections to the landscape in influencing those perceptions, in more detail. We will also offer insights about the implications of our findings for incorporating people's attitudes in management decisions, communicating about wildfire issues with the public, and encouraging more resilient and adaptive communities in the Wildland Urban Interface.

Keywords: social science, landscape recovery, resilience, adaptive capacity, perceptions, mental models, attitudes

Bio: Chad earned his B.S. in Natural Resource Recreation and Tourism at Colorado State University in 2005. After working a few years for federal and NGO land management agencies in Colorado and Nevada, he earned his M.S. from the University of Idaho (CSS Department) in December 2011 studying Colorado residents' attitudes towards forest management after a widespread pine beetle outbreak. His PhD research at Oregon State University, supported by a NASA grant, seeks to understand social aspects of extreme wildfires. He intends to pursue a professional career teaching and conducting research about human dimensions of natural disturbances.

56. Lessons from a Legacy of Wilderness Fire: Benefits, Challenges, and Tools for Success

Presenter(s): Vita Wright, USFS Human Performance RD&A and the NPS Branch of Wildland Fire

Additional Author(s):
Carol Miller, Research Ecologist, Aldo Leopold Wilderness Research Institute
Stephen Kimball, Regional Wilderness Specialist, USDA Forest Service Northern Region
Stu Hoyt, Regional Fuels Specialist, USDA Forest Service Northern Region

The decision to allow a wildfire to burn on its own terms, and for long duration, is one of the most challenging yet important decisions a manager can make. It can involve high risks, uncertain outcomes, and the decision is often faced in an unsupportive, even contentious, social and political environment. For the past 40 years, setting aside the 10 A.M. policy, land managers in the Northern Rockies have faced these challenges and taken advantage of the vast wilderness in the region to learn how to use natural ignitions to accomplish ecological benefits. Fires in the United States' Selway – Frank Church – Gospel Wilderness Complex, Bob Marshall Wilderness Complex, and Glacier and Yellowstone National Parks have shown managers and the public alike conditions under which fires can burn successfully. Many of the champions for wilderness and long duration fire have lived and worked in the Northern Rockies, making the region

a hub of knowledge and experience on the topic. To capture this knowledge, we have interviewed more than thirty past and present fire managers, fire scientists, and decisions makers about the evolution of wilderness fire management in the Northern Rockies, the decision making process, and tools available to support the management of fire for resource benefit. Including interview clips, this presentation draws from the wisdom and insights of those who have a reputable history of managing wilderness fires to convey conditions that allow for successful management of long duration fires, challenges associated with fire management decisions in and near wilderness, and the consequences of both suppression and management for multiple objectives. This information will be captured in a series of videos to provide a valuable resource for managers and line officers currently faced with these decisions, as well as members of the public who struggle to understand agency fire management decisions.

Keywords: wilderness fire, fire use

Bio: A fire social science analyst, Vita Wright works in a shared position between the USFS Human Performance RD&A and the NPS Branch of Wildland Fire. Vita has worked at the interface of science and management for the past seventeen years. Currently, she leads the Northern Rockies Fire Science Network. Previously, she developed and led the Aldo Leopold Wilderness Research Institute's Research Application Program. In addition to disseminating science, she studies organizational culture and organizational learning in support of fire communication and decision making, safety, and the integration of science with management.

57. How effective is wildfire communication to New Zealand communities and how can it be improved?

Presenter(s): E. R. (Lisa) Langer, Senior scientist and research leader, Scion

Additional Author(s):
Mary Hart, Social researcher, Validatus Research Ltd.

Worldwide, most wildfires are caused by human activity (Ellis et al., 2004). Likewise in New Zealand, human activity is responsible for the vast majority of wildfires, which arguably can be largely prevented. Between 1992 and 2007, approximately 3,000 wildfires per annum occurred in New Zealand (Doherty, et al., 2008) and they have been predicted to increase with global climate change, an expanding rural-urban interface and changing fuel loads (Jakes & Langer, 2012).

As a result of the relatively low fire occurrence, evidence suggests that the majority of New Zealand communities have low awareness of the rural fire risk. Consequently communities have low levels of preparedness for wildfire events that could impact on them (Jakes & Langer, 2012). Matched against this, the use of rural fire for land management, recreation and cultural purposes (e.g. cooking food by traditional methods) is relatively high.

Effective communication is the key to raising awareness, minimising human-caused rural fires, and hence the impact wildfires hold for communities. However, how effective is current wildfire communication to New Zealand communities and how can this be improved?

Scion's Rural Fire Research Group analysed communication strategies within three New Zealand rural and rural-urban interface communities and with national fire and land managers as part of an Australasian Bushfire Cooperative Research Centre project. The research has shown that fire agencies should carefully consider their methods of communication, which range from one-way communication using traditional approaches and no face-to-face contact to two-way dialogue with one-on-one personal communication with individuals and communities. The research has concluded that the universal approach used in the past is not effective in communicating rural fire messages. Instead communication needs to target the relevant audiences (rural and semi-rural, recreational users/visitors and cultural fire users and non-fire users). The message must be tailored to fit each audience's needs to optimise the use of limited resources. Information to increase levels of awareness of fire risk is needed by everyone and preparedness information is required for all at-risk property owners. However, information on fire restrictions and appropriate mitigation strategies to ensure safe fire use is not required by non-fire users.

Keywords: communication strategies; rural communities; rural fire users; risk awareness; preparedness.

Bio: Lisa Langer has led Scion's social fire research since 2003. Her qualitative research has focused on community resilience and recovery following wildfires, fire danger warning communication, fire insurance, and mitigating the risk of human-caused fires. Recently she completed a contract for the Bushfire CRC leading the New Zealand component of the Effective Communication fire warnings and preparedness project. She has presented her research at international fire conferences in the US and Europe, as well as to Australian and New Zealand audiences.

FIRE ADAPTED COMMUNITIES

58. Developing fire adapted communities: The importance of interactions among elements of place-dependent local context

Presenter(s): Travis Paveglio, Department of Conservation Social Sciences, University of Idaho

Additional Author(s):
Jesse Abrams, research associate, Ecosystem Workforce Program, University of Oregon
Autumn Ellison, research assitant, Ecosystem Workforce Program, University of Oregon

Resident perceptions and actions related to wildfire management are influenced by a complex set of factors that are often tied to a place-specific context. Existing efforts to predict or understand resident response to the risk and reality of wildfire often focus on the contribution of one or a few influences affecting individual or collective actions for fire mitigations. Fewer efforts take a more holistic view and attempt to understand how various factors collectively influence local response to wildfire across cases. This study responds to that lack by utilizing a recently created framework for understanding adaptive capacity to wildfire in a comparison of preparation and response to wildfire impact across two socially diverse locations. More specifically, we chose to conduct case studies in two different "WUI archetype" communities. Recent research indicates that these different "WUI archetype" communities approach wildfire planning and mitigation in consistently different ways based on local social context. A total of 77 interviews were conducted in 2014 across the two cases. A nearly identical semi-structured protocol was used in both cases. The intent of the research was to better illustrate how elements of local social context collectively influence wildfire perspectives and behaviors in a given locality. Our results suggest that the influence of commonly cited predictors for wildfire mitigation actions, including homeowner's associations, place attachment and previous experience with wildfire can vary based on their interaction with other elements of local context such as residents' desire for privacy, preferences for wildland or ornamental vegetation, identification as "suburbanites" or "country residents," and willingness to collectively organize. We compare our results to a recently developed typology of "WUI archetypes" to assess its usefulness in helping to understand local wildfire mitigation context. We also compare our results to existing wildfire social science findings and argue for a more holistic view of local social context as a way to design tailored strategies for increasing resident responsibility for wildfire.

Keywords: adaptive capacity; Wildland Urban Interface; WUI archetypes; responsibility; mitigation

Bio: Paveglio is an assistant professor in the Department of Conservation Social Sciences at the University of Idaho. He has been conducting research on the human dimensions of wildfire for 10 years. Paveglio has published research on adaptive capacity for wildfire, evacuation and alternatives to evacuation during fire events, simulation of wildfire risk, wildfire mitigation planning and interactions between firefighters and the public. He has an interdisciplinary background in sociology, natural resource sciences and communication.

59. Reducing Structural Losses from Wildfire: Are Regulations the Answer?

Presenter(s): Cheryl Renner, President, Renner Associates, LLC

When wildfires occur adjacent to communities resulting in the loss of homes, businesses, and community structures, people ask how we might have used knowledge or technology to mitigate such a disaster. An understanding of the home ignition zone and how structures ignite leads us inevitably to consider ways to motivate homeowners to reduce fuels around their homes and build with ignition-resistant materials. Many call for regulations, such as wildfire zoning ordinances and building codes, to make development in high fire risk areas safer.

This presentation will review examples of existing regulations, some adopted by states and some adopted by municipalities or counties, which have been effective in motivating homeowners to create and maintain defensible space

around homes. Examples of places where ordinances have failed will also be discussed. The National Fire Protection Association and the International Code Council offer model ordinances to reduce structural losses that can be modified to address local needs and conditions. Many questions remain, such as: should ordinances be national, state, or local in applicability? How can we convince people to adopt wildfire mitigation ordinances? What does it take to enforce such ordinances? How can the ordinances address future vegetative fire hazards that will grow after a subdivision is built? Should ordinances address only new construction, or apply to existing structures? Do neighborhood covenants, codes, and restrictions work?

Keywords: defensible space, wildfire mitigation, ordinances, wildfire zoning, zoning, reducing structural ignitability

Bio: Cheryl has over 20 years experience in land use and forestry planning. She researched wildfire mitigation ordinances for the database, www.wildfireprograms.usda.gov and co-authored a review of state and local regulation for wildfire mitigation for The Economics of Forest Disturbances, by Holmes, Prestemon, and Abt, 2008. She also co-authored the Reducing Structural Ignitability and Strengthening Community Fire Preparedness section of the "Community Guide to Preparing and Implementing a Community Wildfire Protection Plan" (2008).
Cheryl is a former Planning Director and Zoning Administrator for a city in Louisiana, with experience in dealing with the public on land use regulation ordinances.

60. Wildfire policy after structure loss: how does regulation alter rebuilding and residential growth after wildfires?

Presenter(s): Miranda Mockrin, PhD, Research Scientist, USDA Forest Service

Additional Author(s):
Susan I. Stewart, Research Associate, University of Wisconsin
Hillary Fischler, Graduate Student, Oregon State University

The number of structures destroyed by wildfire in the United States has risen dramatically over the past decade, with approximately 1,300 residences lost annually to wildfire since 2000. In response, fire policy now emphasizes the need to create fire-adapted communities, where the community takes responsibility for its wildfire risk by protecting residents and homes through preparedness and risk mitigation. But is this imperative understood and accepted by communities in the wildland urban interface (WUI)? We do not yet have a solid body of evidence to answer this question, in part because of the delays between wildfire events, regulations, and outcomes on the landscape. Drawing from case studies around the country, we examine communities where wildfires caused significant loss of structures from 2009-2011, in order to determine when and where changes were made in regulations post-fire. We examine changes in zoning and lot sizes, codes that require fire-resistant construction materials and defensible space, and broader planning and open space preservation efforts. We then draw from research on WUI growth and rebuilding to look at where and when post-fire residential growth occurred. By combining information on residential development with our work on post-fire regulation, we will describe how changes in governance can contribute to fire adaptation.

Keywords: Fire-adapted, regulations, rebuilding, wildland urban interface

Bio: Miranda Mockrin is a research scientist with the Human Dimensions Program of the Rocky Mountain Research Station, USDA Forest Service, based in the Washington DC area. Research projects include quantifying mapping and tracking the wildland-urban interface over time, examining rebuilding in the wildland-urban interface after wildfires, studying ecological, economic, and social effects of alternative forms of housing development (conservation developments), and disseminating demographic information to natural resource managers. She received her PhD in Ecology from Columbia University in 2008 and started her Forest Service career in the Presidential Management Fellows Program.

61. Fire Adapted Communities in the Real World: Community Perspectives on What Actions and Processes Are Needed for Diverse Communities to Become More Resilient to Wildfire

Presenter(s): Sarah McCaffrey, PhD, Research Social Scientist, Northern Research Station

Additional Author(s):
Bruce Goldstein, Associate Professor, University of Colorado at Boulder
Alicia Davis, Research Associate, University of Colorado at Boulder

The National Cohesive Wildland Fire Management Strategy seeks to foster creation of fire-adapted communities. While policymakers and managers have developed a fire adapted community definition and a list of actions that are considered part of effective adaptation, there is little sense for how communities are interpreting and applying the notion. Understanding whether those on the ground are thinking of fire adapted communities in a similar way as policymakers and managers will be important in ensuring agencies identify how they can best support efforts of local communities to become "fire adapted" in a way that is both site-appropriate and likely to be implemented. The Fire Adapted Communities Learning Network has been established to accelerate adoption, innovation and diffusion of best practices associated with Fire Adapted Communities programs. The network has identified 18 pilot communities that have already begun to take steps to become fire adapted. This presentation will discuss preliminary results from interviews with key stakeholders in five pilot communities to understand their perspective on the topic, what actions they have taken and plan to take to become fire adapted, and how they think that will make them more resilient in the face of fire. How the overall fire adapted community idea is being interpreted, the range of elements being considered by different stakeholders, how the 'community' portion of 'fire adapted community' is being defined, and the perceived advantages and disadvantages of the concept will be discussed.

Keywords: Fire Adapted Communities, Preparedness, Mitigation, Communication, Collaboration

Bio: Sarah M. McCaffrey, Ph.D. is a Research Social Scientist for the USDA Forest Service, Northern Research Station. Her research focuses on the social aspects of fire management. This has included National Fire Plan and Joint Fire Science sponsored projects examining the characteristics of effective communication programs and the social acceptability of prescribed fire, thinning, and defensible space. More recently she has begun work on the social issues that occur during fires including alternatives to evacuation and community-agency interactions during fires.

HEALTH

62. Preliminary evaluation of factors affecting inhalation exposures among wildland firefighters

Presenter(s): Tim Reinhardt, CIH Associate Scientist, Amec Foster Wheeler PLC

Additional Author(s):
George Broyles, Fire & Fuels Project Leader, US Forest Service

Preliminary Evaluation of Factors Affecting Inhalation Exposures among Wildland Firefighters
In this paper, we present preliminary results of a statistical evaluation of various site, environmental and work activity factors on the shift- and fireline-average smoke exposures among wildland firefighters in the U.S. Inter and intra-crew variability to exposure and exposure metrics for fireline overhead personnel will be presented.

Wildland firefighters work in a dynamic environment and are exposed to a variety of hazards, including inhalation hazards from fire smoke, soil dust and powered equipment exhaust. Potential health effects include short-term conditions such as headaches, fatigue, nausea, and respiratory distress while long-term health effects may include an increased risk of cardiovascular disease.

The USFS under took a four year project to quantify exposure for wildland firefighters across the United States. Data was collected on wildland and prescribed fires in 17 states representing 11 of the 13 NFDRS fuel models. Exposure to carbon monoxide, respirable particulate matter (PM4) and crystalline silica (SiO2) were measured in the breathing zone of firefighters. Direct observation of firefighters was done in order to determine which variables are related to high exposure so that firefighters and fire managers can be better prepared to reduce these exposures. Measurements were also taken at incident base camps. During the four-year study, 7,517 hours of CO measurements on firefighters and 1,554 hours of CO measurements at ICPs and spike camps were taken.

Based on the findings there has been no appreciable reduction in firefighter smoke and dust exposure from levels that previous research had found. Exposure to wildland smoke has direct consequences on the ability of firefighters to remain safe by compromising their ability to think clearly and function at their highest mental and physical level. Exposure to the harmful constituents in wildland smoke must be addressed effectively in order to assure risk management decisions are sound.

Partial funding for this project is comes from JFSP Project Announcement No. FA-FON0013-0001, task statement 2; Health impairment from exposure to fire smoke: Relationships among the National Ambient Air Quality Standards (NAAQS) and industrial health guidelines.

Keywords: Inhalation irritants, carbon monoxide, silica, particulate matter, risk management, firefighter health and safety

Bio: Tim Reinhardt holds a BS in Environmental Science (Washington State University) and MS in Forest Resources (University of Washington) and has over 30 years' experience in air quality, human health risk assessment, and health, safety and environmental compliance. He worked as a wildland firefighter in 1978-79 with the USDA Forest Service, assisted emissions measurement research in the 1980s with the USDA-FS Pacific Northwest Research Station, lead research performing occupational exposure measurements among firefighters in the 1980s and 90s, and has been a Certified Industrial Hygienist since 1992.

63. Adaptation of physical training and task performance to wildland firefighting in Spain. Improving firefighters wellness, capabilities and safety

Presenter(s): Elena Hernandez Paredes

Additional Author(s):
López Satué, Jorge. Wildland firefighters professional trainer Coordinator. Empresa de Transformación Agraria, TRAGSA. Spain.

Understanding the need to adapt the physical training and task performance to the singular characteristics related to the environmental conditions and the type of work in wildland firefighting makes a great difference in firefighters wellness, capability and safety. Since 2007, the Spanish Forest Fire Service has launched and implemented a specific program focused on these relevant aspects. The analysis of several indicators, such as heart rate, level of dehydration, core temperature, carbon monoxide inhalation, heat flux exposition, and environmental temperatures during real wildland fire operations plus the direct observation of the different suppression performances and the amount of injuries suffered by the firefighters have made us develop specific fitness programs for our wildland firefighters. These programs, after almost 8 years of existence, have shown us great results in terms of damage rates reduction, efficiency rates improvement and safety and performance enhancement.

Keywords: Wildland firefighters, physical training, safety, fitness program, environmental conditions, suppression.

Bio: Forestry engineer with a Master of Science (M.Sc.) in Forestry by Technical University of Madrid and a Master in Occupational Safety & Health, specialized in Risk Prevention.
Service Manager at the Forest Fire Service, Ministry of Agriculture, Food and Environment in Spain since 2009. Previous experience in wildland firefighting as helitack crew boss for 4 years.
Manager of the National Helitack Crews (BRIF), over 500 people. Coordinator at national level of wildland firefighting safety issues and training. Technician on duty at the Wildland Fire National Coordination Center.
Participation at international level in several working groups on wildfires (FAO-Silvamediterranea; European Commission; UNISDR).

64. A Review of Wildland Fire Smoke Exposure and Its Health Effects on Wildland Firefighters and the Public

Presenter(s): Olorunfemi Adetona, PhD

Additional Author(s):
Luke Naeher PhD
Timothy Reinhardt
Anna Adetona
Guannan Huang
Roger Ottmar, PhD
George Broyles, MS
Michael Kleinman
Joseph P. Domitrovich

Each year, the general public and wildland firefighters in the United States and globally are exposed to smoke from wildland fires. As part of an effort to characterize health risks of breathing this smoke, a review of the literature was conducted using six major databases, including PubMed and MEDLINE Web of Knowledge, to identify smoke components that present the highest risks, the mechanisms of toxicity, the health effects that have been identified in epidemiology studies, and the current gap in knowledge on the health impacts of wildland fire smoke exposure.

Components for which detectable measurements have been reported include particulate matter (PM), major gases, hydrocarbons, alcohols, aldehydes/ketones, organic acids, esters and exotic compounds such as polychlorinated biphenyls and dioxins. Of these, PM, carbon monoxide and formaldehyde are the components of most concern based on hazard indices calculated from the maximum reported or estimated average exposures from the studies.

Respiratory and cardiovascular events measured in time series studies as incidences of disease-caused mortality, hospital admissions, emergency room visits and symptoms in asthma and chronic obstructive pulmonary disease patients are the health effects that are most commonly associated with community level exposure to wildland fire smoke. These effects were mostly observed in association with ambient air concentrations of fine particulate matter (PM2.5). Wildland firefighters, although healthier than the general public, are exposed to toxic mixtures containing high concentrations of carbon monoxide and formaldehyde in addition to elevated levels of PM. Research into the health effects of this toxic mixture is currently limited.

There is a need for research on acute and longer term effects of wildland fire smoke exposure. The health effects of acute exposures beyond susceptible population and the effects of chronic exposures experienced by the wildland firefighter are largely unknown. Longitudinal studies of wildland firefighters during and/or after the firefighting career could help elucidate some of the unknown health impacts of cumulative exposure to wildland fire smoke and the workplace protection that could be required for the occupation.

Bio: Currently, I am working as a postdoctoral research associate at the University of Georgia. My training is in toxicology, and is focused on human exposure to environmental agents and the assessment of associated health effects. My doctoral degree research was on occupational wood smoke exposure and its acute health effects on lung function and oxidative stress among wildland firefighters.

65. Assessment of the Barriers to Wildland Firefighters' Fitness Training

Presenter(s): Aria,Mangan, M.S. Candidate, Research Assistant, University of Montana

Additional Author(s):
Aria Mangan, Research Assistant, University of Montana
K. Ann Sondag, PhD. Project Director, University of Montana
Joseph Domitrovich, PhD. Exercise Physiologist, University of Montana and MTDC

Introduction: Working on a wildland fire can be physically and mentally taxing. Given the physical demands of the job, fitness is a key component in keeping wildland firefighters (WLFFs) healthy and safe from injury. Unfortunately little is known about physical training (PT) regimens of WLFFs.

Purpose: The purpose of this study was to examine motivators and barriers to PT in WLFFs. Personal, interpersonal, organizational and environmental factors that influence PT were identified. Strategies for overcoming barriers were recommended.

Methods: This study utilized a descriptive research design. Information about PT practices was collected through interviews with key informants (i.e. individuals in leadership positions who work directly with crew members). Interview data was analyzed qualitatively. Additionally, a questionnaire was developed, reviewed by experts, pilot tested and distributed electronically to WLFFs. Questionnaire data was entered in the SPSS statistical program. Barriers and motivators to engaging in PT among distinct categories such as agency type and crew type were examined for differences among the categories.

Results: Fourteen interviews were conducted with key informants from multiple state, federal and volunteer agencies. Two over-arching concepts emerged from interviews as major influences on PT. The first concept, firefighter culture, encompassed several themes. Themes included the powerful influence of leadership and the desire to be seen as a

strong, capable and dependable crew member. The second concept, environment, included the influence of factors such as training facilities and equipment and the need for more holistic education about PT and health. Preliminary questionnaire results from nearly 1000 firefighters reveal the most frequently identified barrier to PT to be projects and work related trainings taking precedence over PT. Multiple motivating factors were identified including having a supervisor that participates in PT and wanting to be seen as a strong crew member.

Conclusions: This project was an attempt to gain an understanding of the current physical training practices of wildland firefighters. More importantly, results from this study identify, from the perspective of the firefighters themselves, the major motivators and barriers to engaging in quality, consistent physical training.

Keywords: Physical Training, Barriers, Motivators,Wildland Firefighters

Bio: Aria Mangan has a B.A. in Biology with a minor in Health and Human Performance. Aria is currently a Master of Science Candidate at the University of Montana studying Health and Human Performance with an emphasis in Community Health. Aria has six seasons of wildland fire experience working for the Forest Service in Region 4 and Region 1. Aria is currently working as a Research Assistant at the University of Montana.

66. An Alternative Way to Estimate Wildfire Smoke Health Costs? A Case Study of a Southwestern US "Mega-Fire" using the Benefits Mapping and Analysis Program – Community Edition (BenMAP-CE)

Presenter(s): Benjamin A. Jones, MA, PhD Candidate, University of New Mexico

Additional Author(s):
Jennifer A. Thacher, PhD, Associate Professor, Economics, University of New Mexico
Janie M. Chermak, PhD, Professor and Chair, Economics, University of New Mexico
Robert P. Berrens, PhD, Professor, Economics, University of New Mexico

Exposure to wildfire smoke can increase morbidity in urban areas. Research calls for monetizing human health impacts in wildfire damage assessments. However, if original health outcome data are collected, valuing wildfire-related health impacts is costly and time-consuming. Benefits transfer is a more accessible alternative that is often employed. Yet several methodological issues remain unexplored regarding transfers of air quality concentration-response functions and economic values. These issues are largely ignored in wildfire smoke damage assessments. This research provides a case study illustration of a new tool for estimating wildfire smoke damages, the US EPA benefits mapping and analysis program – community edition (BenMAP-CE), which is used to investigate methodological issues surrounding the analyst's choice between transferring results from "wildfire-specific" or "urban air" (unrelated to wildfire) studies. The case study is of a southwestern US "mega-fire" event. Results indicate that the economic costs of a wildfire smoke event are substantial. Additionally, transfer of wildfire-specific study results produces substantially higher morbidity incidence estimates and costs compared to use of results from urban air studies. These findings demonstrate: (1) that BenMAP-CE can be applied to wildfire events and (2) the importance of transferred study appropriateness when conducting a smoke damage assessment using benefits transfer.

Keywords: wildfire, benefit transfer, health effects, smoke, BenMAP-CE, willingness to pay

Bio: Benjamin is a 4th year PhD candidate in the Department of Economics at the University of New Mexico and a Doctoral Fellow of the Robert Wood Johnson Foundation Center for Health Policy. His research focuses on the environment-health nexus where economics can be used explore the human health and labor dimensions of changes to the natural environment. Ongoing work explores the interactions between environmental policy and health within the context of invasive species such as the emerald ash borer, wildfire smoke exposure in urban areas, and use of artificial light at night.

67. Impact of a Flame Resistant Synthetic Material Base Layer on Heat Stress Factors

Presenter(s): Matthew Dorton, Masters Student, University of Montana

Additional Author(s):
Joseph Domitrovich PhD, Exercise Physiologist, Forest Service
Brent Ruby PhD, Professor, University of Montana
Charles Dumke PhD, Professor, University of Montana

Protective clothing worn by wildland firefighters (WLFF) may increase physiological strain and heat stress factors due to increased insulation and decreased ventilation. The effect of a flame resistant synthetic material base layer on heat stress factors

Bio: Matt Dorton is a graduating masters student at the University of Montana. His research interests include the physiological responses to exercise and the environment.

SPECIAL SESSION TWO: WILDFIRE MANAGEMENT IN COUPLED HUMAN AND NATURAL SYSTEMS: INTEGRATING BIOPHYSICAL AND SOCIOECONOMIC INFORMATION

Current wildfire risk management efforts focus on assessing and managing the biophysical sources of wildfire risk, such as fuel loading reduction, and these efforts have often successfully allowed for the allocation of scarce resources to areas where they are most effective in reducing wildfire risk. However, the need for more integrative approaches to managing wildfire risk is rapidly growing, as wildfires in the western US and elsewhere occur with increasing frequency and size, often exceeding institutional capacities for their control and suppression. It is increasingly recognized that wildfire-related problems are not solely biophysical, but actually exist within a social-ecological context. Landowners' wildfire risk perceptions, economic dependence, governance, and other socio-economic values contribute to defining landscape management objectives and the capacity of landowners and land managers to mitigate wildfire risk potentials. In this context, coupled natural and human systems (CHANS) research, which explicitly recognize links between humans and their environments, can provide insights into the sustainability of fire-prone landscapes. Moreover, an integrated biophysical-socioeconomic approach enhances the ability of stakeholders, decision-makers, and scientists to jointly identify and assess landscape-level scenarios of risk mitigation effort on both public and private lands.
In this session, we will explore the characterization of CHANS for the management of risk in fire-prone forest landscapes, with an emphasis on the integration of biophysical and socioeconomic information to improve the efficacy of investments to reduce wildfire risk.

68. A conceptual framework for coupling the biophysical and social dimensions of wildfire to improve fireshed planning and risk mitigation

Presenter: Jeffrey D. Kline

Additional Author(s):
Alan A. Ager, Operations Research Analyst, USDA Forest Service, Pacific Northwest Research Station
A. Paige Fischer, Assistant Professor, University of Michigan

The need for more sophisticated approaches to managing wildfire risk is becoming more recognized as uncharacteristically large wildfires in the western US and elsewhere overwhelm government capacities for their control and suppression. Natural hazards research suggests that to be effective, the process of evaluating and mitigating hazards must address the influence of both biophysical and social factors of risk. Wildfire risk is influenced both by biophysical factors that determine the likelihood and intensity of wildfire in particular locations, and social factors that determine how landscape managers, local officials, and individual landowners perceive and address risk. We propose a coupled biophysical-social framework to managing wildfire risk that relies on wildfire simulation to identify spatial patterns of wildfire risk and transmission within "firesheds" surrounding communities, and social science to understand wildfire risk perceptions and the degree of collaboration and mitigation behavior landscape managers, local officials, and individual landowners.

A coupled biophysical-social approach to managing wildfire could provide an improved method for defining the spatial extent of wildfire risk to communities compared to current planning processes. It creates an explicit role for social science to improve understanding of community-wide risk perceptions and predict landowners' capacities and willingness to mitigate risk by treating hazardous fuels and conducting Firewise activities. The approach would enable identifying potential comparative advantages in the location of risk mitigation effort, whether on public or private lands, according to the degree to which specific locations contribute to the transmission of wildfire risk and how likely landowners are to mitigate risk. We will demonstrate a potential application of the framework and approach to managing wildfire risk in communities located in fire-prone landscapes, by combining recent advances in wildfire simulation modeling with social science, including social network analysis, examining the likelihood of risk mitigation effort. Such coupled systems approaches potentially can contribute to a more effective implementation of the new Federal Cohesive Strategy, and provides a more robust framework for prioritizing federal fuel management investments.

Keywords: wildfire risk transmission, wildfire risk mitigation, firesheds.

Bio: Jeff Kline is a research forester with the USDA Forest Service's Pacific Northwest Research Station in Corvallis, Oregon. He has worked with forestry and land use issues for 30 years with nonprofit, state, and federal agencies and organizations. He has a MS degree in Resource Administration and Management from the University of New Hampshire, and a PhD in Environmental and Natural Resource Economics from the University of Rhode Island. His current research examines the effects of population growth and land use change on forests and their management, and related changes in how the public uses and values forests.

69. The dynamics of fire-prone coupled human and natural systems (CHANS) and the emergence of wicked problems

Presenter: Patrick Bourgeron, INSTAAR, University of Colorado

Additional Author(s)
Jelena Vukomanovic
Hope Humphries

Environmental issues in coupled human and natural systems (CHANS) often bear the characteristics of wicked problems. These are complex problems where there is no single definition of the issues, no definitive and optimal solution exists, and proposed solutions create unintended secondary problems at different spatio-temporal scales and in different domains. Wicked problems in fire-prone CHANS are the consequences of multi-scale and multi-domain organization, which can display non-linear responses to drivers of change and can cause cascading thresholds. Because wicked problems always occur in a social context, they are often overlooked by natural scientists. In the Colorado Front Range (COFR) CHANS, a fire-prone system, we investigated the specific circumstances under which crossing a single threshold between alternative regimes can lead to a "cascading effect", in which multiple thresholds across scales of space, time, and social organization, and across ecological, social, and economic domains may be breached. We explored the conditions under which such cascading thresholds result in a wicked problem. We then applied the wicked-problem framework to the effects of interactions between climate and human-mediated changes on COFR CHANS and analyzed the trade-offs in ecosystem services occurring across space and time with different degrees of reversibility.

70. Impacts, trade-offs, and cross-scale connections between wildfire and ecosystem services in the Colorado Front Range

Presenter: Jelena Vukomanovic

Additional Author(s):
Patrick S. Bourgeron, Senior Research Associate, Institute of Arctic & Alpine Research, CU-Boulder

The wildland-urban interface (WUI) occupies 9% of the conterminous land surface of the US and contains 39% of all housing units. The increased presence of people in the Colorado Front Range due to residential development (exurbanization) and recreation, along with increasing disturbances such as fires and insect outbreaks, can lead to decreases in key ecosystem services (ES). In fire-prone landscapes, understanding the changes to ES from fire is critical to characterizing the sustainability of social-ecological systems. We review the connections between ES and fire and assess the cumulative impacts and trade-offs that may result from these connections in the context of residential development. We present a conceptual and methodological approach to characterize and evaluate these connections, with the goal of improving the assessment of impacts resulting from changes in ES by identifying knowledge gaps, research priorities, and challenges. Exurban development and recreation result in trade-offs between ES, highlighting the challenge of predicting and managing changes to ecosystem function under changing land-use patterns; improved assessment of impacts and connections can help guide decision-making and planning.

Keywords: ecosystem services; exurbanization; land-use change; social-ecological systems; trade-offs; Colorado

Bio: Jelena Vukomanovic holds a PhD in Arid Lands Resource Sciences from the University of Arizona and is a Research Associate at the Institute of Arctic and Alpine Research, University of Colorado – Boulder. A landscape ecologist whose expertise lies in coupled human-natural systems and the human dimensions of natural resources, she uses mixed methods to model the spatial and temporal dynamics of landscape change in the wildland-urban interface. Jelena studies the drivers and impacts of land-use changes and demographic shifts in exurban areas by examining trade-offs in ecosystem services and characterizing thresholds across scales and domains that lead to alternative regimes.

71. Linking Forest Management and Fire Hazard Conditions in the Eastern Cascades Ecoregion

Presenter: Susan Charnley, PhD, Research Social Scientist, US Forest Service

Additional Author(s):
Thomas A. Spies, Landscape Ecologist, US Forest Service

This paper aims to increase understanding of human adaptation to fire-prone landscapes in Oregon's Eastern Cascades Ecoregion by examining feedbacks between the fire management actions of large forest landowners, and fire hazard conditions on their ownerships. The questions addressed are: 1) how do landscape conditions combined with external social drivers influence the forest and fire management actions of large landowners; 2) how do the forest and fire management actions of large landowners influence fire hazard conditions on their ownerships; 3) how adaptive are the fire management behaviors of different large landowners; and 4) what can we learn from this assessment for improving human adaptation to fire-prone ecosystems? The large landowners of interest are the U.S. Forest Service, private corporate forest owners, and the Oregon Department of Forestry; we compare and contrast forest and fire management practices, and fire hazard conditions, both within and between these ownerships. The geographic area of focus is south-central Oregon.

Our analysis combines both social and environmental data. Environmental data characterizing fire hazard conditions on different land ownerships are derived from fuels models and vegetation structure data. Data characterizing landowner management approaches and their social and ecological drivers are derived from in-person interviews and agency databases. An agent-based model called Envision is used to project future fire hazard conditions on the different ownerships under current management scenarios, helping to assess how adaptive the management actions of different landowners are. By combining social and environmental data to better understand the fire management decisions of landowners, this analysis improves understanding of coupled human and natural systems on large forest ownerships in the Eastern Cascades Ecoregion, and points to policy and practices to improve human adaptation to fire-prone landscapes.

Keywords: human adaptation to fire-prone landscapes; Forest Service; private corporate forestry

Bio: Susan Charnley is a research social scientist with the USDA Forest Service's Pacific Northwest Research Station in Portland, Oregon. As an environmental anthropologist, her research focuses on natural resource use and management among rural producers, and the institutions needed to help support sustainable livelihoods and healthy ecosystems on public, private, and communal lands. She works mainly in the western United States and Africa.

72. Predicting WUI homeowners' fire risk mitigation behavior under different landscape management and climate scenarios

Presenter: Christine Olsen

Additional Author(s):
Keith Olsen, Senior Faculty Research Assistant, Oregon State University
Emily Platt, Planning and Monitoring Specialist, USDA Forest Service Region 6
Jeff Kline, Research Forester, USDA Forest Service Pacific Northwest Research Station
Eric White, Senior Research Assisstant Professor, Oregon State University
Tom Spies, Research Forester, USDA Forest Service Pacific Northwest Research Station

As wildfires have grown in size and number in recent years, the size of the wildland-urban interface (WUI), where wildland vegetation meets urban development, has also increased through amenity migration and a growing suburban population. This has led to greater numbers of human lives, properties, and values at risk of wildfire. Conceivably, WUI homeowners can reduce their level of wildfire risk by using non-flammable construction materials, pruning nearby branches, and reducing tree density, among other wildfire risk mitigation measures. Commonly known as defensible space, it is generally agreed that these actions improve the survivability of homes during wildfires. However, many homeowners still do not act. In this study we use an agent-based modeling framework that was programmed using survey data to predict WUI homeowners' fire risk mitigation behavior under different landscape management climate scenarios over a 50-year period.

We will present a conceptual model describing WUI homeowners' propensity to conduct mitigation activities for reducing wildfire risk, as well as a coupled human and natural systems (CHANS) agent-based modeling framework for examining fire-prone landscapes. Data for the conceptual model came from a 2012 mail survey in central Oregon that asked homeowners about their mitigation activities, in conjunction with wildfire modeling and spatial landscape variables. Analysis from this model, which showed that landscape conditions influence mitigation behavior, was then used to inform homeowner decision-making rules in the CHANS agent-based modeling framework. Other actors in this landscape included federal managers, industrial owners, tribes, and non-industrial private landowners. This framework was run for 50-year projections under different management and climate scenarios, including: current management policy for federal land, no management on federal land, current policy without WUI treatment preference, and a restoration approach, as well as the current and restoration scenarios with increased climate change. Output from the framework predicts homeowners' propensity to mitigate on their properties under the different scenarios. Results from this analysis will improve our understanding of possible homeowner responses to landscape management and climate changes in the future.

Keywords: firewise, defensible space, communities

Bio: Christine Shaw Olsen, PhD, is a Research Social Scientist in the Department of Forest Ecosystems & Society at Oregon State University in Corvallis, Oregon. Dr. Olsen is co-investigator of the Northwest Fire Science Consortium and researches citizen-agency interactions, public opinions about fire and fuel reduction activities, fire mitigation behavior on private land, and communication and education about forestry and fire. Her most recent projects examine public perceptions of smoke, citizen-agency trust, and homeowner perceptions of fire risk and mitigation behavior. Dr. Olsen teaches classes about managing for multiple resource values, sustainable natural resource management, and social science research methods.

73. SPECIAL SESSION THREE:
Rethinking Awareness, between firefighter safety and safety strategy

Presenter: Marc Castellnou, Fire Manager, Catalan Fire Service,
Al Beaver

Additional Author(s):
Marta Miralles, GRAF Fire Analyst, Catalan Fire Service
Josep Pallàs, GRAF Firefighter, Catalan Fire Service

Entrapments during wildfires continue to happen in spite of the increase in safety protocols use, awareness implementation and lessons learnt put into practice inside firefighting organizations worldwide. In fact, a closer look to entrapments history tell us lessons to be learnt keep piling up in our lists for every new accident.

Almost after any accident review a LACES failure is signaled as explanation, specially a failure in awareness. So we find ourselves piling up again lessons to be learnt inside the A of Awareness. The A in the protocol is getting big and big again. All we pretended to simplify is getting complex again and bottleneck on decision making is forming due the quantity of factors to think about, inside the fire and outside it. As a consequence we feel the pressure to be aware of everything since we cannot differentiate what is important and what is not. Under this scenario, uncertainty is gaining ground in our mind when it comes to decide.

In recent accidents, we have been working in crew member's decision making analysis using mind maps methodology. We use those to understand instead of judging the information firefighters manage when deciding under pressure when they realize an entrapment is possible. We are looking to identify exactly what information and noise they had in their situational awareness. This approach adds light to the ongoing discussion about if failure on decision making in entrapment situations can be seen as consequence of protocol awareness at crew level or as organization information management failure. If what happens is because we failed, there are things to learn, protocol implementation to improve, and especially lessons learnt to remember. But if what happen is not a mistake and the decision was right according the information available, then we have to look at the organization itself and its way to manage information. We have to look our organization and try to figure out how to manage external uncertainty in order to avoid collapse. We cannot in any case charge external factors awareness into crews that manage only internal fire factors information. This of course is adding uncertainty into our fire services, making them more defensive, less aware of the fast-changing-realities they are working in.

If we organize our fires making sure that different levels of command take care of different levels of awareness then uncertainty can be reduced into a manageable amount of information. We can bring back more simple analysis this way distributing awareness, and serving as organization our crews needs instead of adding pressure on them.

Critics to this approach are based in the fact that not all uncertainty can be reduced, especially that one coming from unpredictable situations. To reduce it we propose an uncertainty management based on scenario building using the knowledge we have about external influencing factors and internal influencing ones. Corrections have to be made in those uncertain scenarios before sending crews in. In fact what this does is to assume part of the awareness (the one based on external factors) goes into strategic planning and leave only internal factors and tactics for crews in those already certain situations.

Packing uncertainty reduces awareness weight and situation can be managed with more simplicity, speeding up the decision making again.

Keywords: uncertainty awareness safety LACES
Bio: Marc Castellnou is a fireman with over 25 fire seasons and over 60 large fires in Spain, France, Greece, Scotland and USA. He has extended experience in incident strategy, operation commandment and forest fire management. He introduced the concept of fire analysis in Europe, and has developed it extensively. Marc is the Forest Area Chief inside the Catalan Fire Service, where he introduced the Prescribed Burning Program. He promoted a lessons learned culture, and a shift towards fire management and strategical decision-making in forest fires. Marc has been working in fire management projects all over Europe. Marc is founder and Chairman of Pau Costa Foundation, a platform on forest fire management, as well as an instrument to divulgate and investigate in fire ecology..

Al Beaver - During a forty year career in wildland fire management Al worked in most aspects of the business in Canada, Alaska, Sweden and Australia. Al is a nationally qualified Fire Behaviour Analyst and was a member of the instructor cadre for the Canadian Advanced Fire Behaviour and Fire Behaviour Specialist Courses where he instructed on fire behaviour relating to firefighter safety. He presented at the first Fire Wildland Fire Safety Summit in Rossland, British Columbia and in 2000 was the recipient of the Wildland Fire Safety Award.
Al moved his career to Victoria, Australia in 2009 where he worked in Strategic Risk Management Planning, Risk Modelling and Decision Support Systems and Fire Behaviour Based Readiness and Response.

LEADERSHIP
74. Resonant Relational Leadership

Presenter(s): David Christenson

Have many leaders brought out the best in you or not? What did they typically say or do? How did they make you and others feel? We know what good leadership is like when we experience it. We also know what poor or dysfunctional leadership feels like.

The best leaders build or rebuild resonant relationships. These are relationships in which the leader is in tune with or in sync with the people around him or her. Leadership is about the relationship between the leader and the people around him or her.

What can we learn from recent developments in science that can help us understand what resonant relational leadership can do for us?

A growing body of research on the human brain proves that, for better or worse, leaders' moods affect the emotions of the people around them. The reason for that lies in what scientists call the open-loop nature of the brain's limbic system, our emotional center. A closed-loop system is self-regulating, whereas an open-loop system depends on external sources to manage itself. In other words, we rely on connections with other people to determine our moods. A leader's mood has the greatest impact on performance when it is upbeat. But it must also be in tune with those around him. We call this dynamic resonance.

1. Emotional intelligence competencies are the competencies that enable you to be aware of your own emotions and manage them.

2. Social intelligence competencies are the competencies that enable you to be sensitive to others' emotions and manage your relationships with them.

An emotionally and socially intelligent leader can monitor his or her moods through self-awareness, change them for the better through self-management, understand their impact through empathy, and act in ways that boost others' moods through relationship management.

Take 20 minutes to learn a few ways you might improve your ability to lead yourself and others.

Keywords: Relational Leadership, Emotional and Social Intelligence

Bio: David is the CEO of Christenson & Associates, LLC, a consultancy group primarily serving safety-critical, high-risk industries and now doing business with other groups as O4R: Organizing For Resilience. This organization serves others with education, training, coaching and mentoring in professional leadership development, advanced emergency management, and principles-based thinking. David completed the Masters of Science degree program in Human Factors and Systems Safety at Lund University, Sweden in 2012. He is currently exploring PhD opportunities with the Taos Institute.

(2002 – 2014) Assistant Center Manager of the U.S. Wildland Fire Lessons Learned Center, National Advanced Fire & Resources Institute

75. Transfer of Knowledge, Skills, and Abilities from Leadership Development Training

Presenter(s): Michael T. DeGrosky, Chief Executive , Guidance Group, Inc

Leadership development training represents a form of human resource intervention, the fundamental purpose of which is to improve organizational performance. However, leadership development training represents a useful intervention only when participants transfer what they learn into enduring workplace practices. Both researchers and training practitioners use the term training transfer to describe the process by which training participants extend learned knowledge, skills and abilities into the workplace beyond the training environment and sustain those learned knowledge skills and abilities over time. The researcher's qualitative investigation examined lived training transfer experience by interviewing 17 participants in the National Wildfire Coordinating Group's L-380 leadership development training intervention. The author identified eight factors that motivated the study's participants to transfer the knowledge, skills and abilities (KSAs) they had learned in their leadership development training. In this paper, the author explored the importance of two of those factors, (a) self-understanding and self-improvement and (b) resonance. The author also discussed findings that the degree to which the study's participants perceived meaning from their training influenced both the participants' desire to learn the proffered KSAs and their desire to turn those KSAs into routine workplace practice. Both training practitioners and academics interested in the efficacy of leadership development training can use the findings of this study to understand how participants in a leadership development training intervention experienced their own motivation to transfer learned KSAs from leadership development training into professional practice and how those experiences influenced participants' later transfer of what they learned into professional practice. Understanding these motivations will prepare, both training practitioners and academics to improve the aptitude of organizations for providing training participants with the capacity to transfer their training into the workplace as a significant driver of training effectiveness.

Keywords: Leadership, Training Transfer, Leadership Development, Self-understanding, self-improvement, resonance, motivation to transfer, training effectiveness

Bio: Michael DeGrosky is Chief Executive of Guidance Group, Inc. a consulting firm specializing in the human and organizational aspects of the fire and emergency services. He is an experienced wildland and municipal fire professional with an emergency service background spanning 37 years. Mike is an alumnus of the University of Montana, School of Forestry and Fort Hays State University, College of Business and Leadership, where he earned a master's degree in organizational leadership. He earned a PhD in Business Administration with a specialization in Organizational Leadership from Northcentral University.

76. The relationship of mindfulness and self-compassion to desired wildland fire leadership

Presenter(s): Alexis Lewis Waldron, PhD, Post Doctoral Scholar, Oregon State University

Additional Author(s):

Vicki Ebbeck, Assistant Professor, Oregon State University

Advances in training and strategies have been made in wildland fire human factors with the inception of the "L-Courses" or leadership courses developed in 2004 with the publication of the internal agency document Leading in the Wildland Fire Service (National Wildland Coordinating Group [NWCG], 2007). While this document has served as a foundational piece for moving leadership and human development forward in wildland fire, more empirical support from the wildland firefighting environment has been needed. Through previous research that Lewis (2008) conducted using a qualitative approach to investigate how fire personnel describe good, safe, and effective leadership in wildland fire in the U.S., a scale was developed which was used in this research to assess wildland fire leadership qualities, behaviors, and actions that firefighters have described as important. The current research has sought to increase the empirical work of leadership in wildland fire while building on previously established foundations.

A quantitative approach was adopted to explore facets of mindfulness and self-compassion in relation to their ability to predict crewmembers' perceptions of their supervisors' leadership capabilities. The sample was comprised of 43 wildland fire crews consisting of their primary supervisors (N= 43) and crewmembers (N=246) in the Western United States. A partial least squares path modeling approach was employed to test hypotheses of how supervisor' scores on aspects of mindfulness and self-compassion predicted crewmembers' perceptions of their supervisors' leadership. Findings revealed that supervisors who scored higher on certain aspects of mindfulness and self-compassion predicted higher leadership scores rated by their crewmembers. These results suggest that leaders who are more mindful and self-compassionate (in certain aspects) are perceived by their crewmembers as being better leaders in terms of competent decision-making, integrity, and personal genuineness. These results also indicate the potential that developing mindfulness and self-compassion in wildland fire leaders could have on the ultimate performance and safety in the wildland fire environment.

Keywords: Mindfulness, Self-Compassion, Leadership, Wildland firefighters, Supervisors

Bio: Dr. Waldron has been a wildland firefighter for 10 seasons on hand crews, engine crews, helitack crews, and heli-rappel crews, and has served as a human factors specialist for fatality incidents. Based on hers and others near misses/accidents and leadership experiences in fire she has developed a drive to build and enhance fire trainings and tools based on what firefighters have expressed is important. Dr. Waldron has used the tools developed with firefighters not only to develop firefighters personally and professionally, but also various athletes, challenge course facilitators, and other outdoor professionals.

77. Stockholm vs Woodstock: Risks Associated with Leadership

Presenter(s): Bill Arsenault, Operations Lead, Gem County Fire-EMS

Additional Author(s):
Curtis Sandy, MD, Board-certified ER Physician and EMS Medical Director

As wildfire professionals begin to understand the generational gap, firefighters are having a differing sense of opinions related to risk in the wildland fire environment. Understanding those gaps is critical to operational success. Organizational changes, sense-making, and self-preservation are successful keys to managing people and risks on a daily basis for wildland fire professionals. The one primary component to a successful operation is: communication. Highly successful military operations, fortune 500 companies, and emergency services organizations have adapted to the technical, global, and un-stoppable newer generation of professionals.

A secondary supportive component is "change management". By impliamenting that mental change, wildland fire professionals can expect a higher level of personal, crew, and agency intergrity and professionalism.

This discussion will provide insight on how to help the forward progression that we sometime get lost in. It will also provide the participant an understanding of how the human mind wraps it self around leadership nuances.

Keywords: Risk management, self-preservation, leadership, followership, communication, organizational changes, behavior

Bio: Bill Arsenault is a 25 year veteran of emergency services. He has operated in wildland/structural fire, EMS, military,

and law enforcement environments. In addition, presented at the 2011 IAWF Safety Summit. He is known throughout the wildland fire community as a medical response SME for all-risk incidents.

78. Leadership, Accountability, Courage and Knowledge

Presenter(s): Victor Stagnaro, National Fallen Firefighters Foundation

This compelling presentation by the National Fallen Firefighter Foundations examines the root causes of LODD's and the role of Leadership, Accountability, Culture and Knowledge as it influences the end result. Many fire departments and agencies across the United States "LACK the Right Stuff" to prevent them from being on a path to a line of duty death, with Leadership, Accountability, Culture and Knowledge being the elements that need to be addressed and managed in those environments. Through education and training, those departments can improve their survivability by understanding the root causes of firefighter fatalities and tackling these four elements with special emphasis on understanding the culture of safety.

Keywords: Leadership, Accountability, Culture, Knowledge

Bio: Victor Stagnaro joined the staff of the National Fallen Firefighters Foundation in early 2010. He serves as the Director of Fire Service Programs, which includes the Everyone Goes Home®, the Local Assistance State Teams and the Taking Care of Our Own programs and courses. Victor's involvement with the NFFF dates back to 1998, when he served as the Incident Commander for the Memorial Weekend, a post he held for several years. He also assisted with the Foundations New York Response Team on 9/11. Prior to be hired by the NFFF, he worked for the Prince George's County Fire/Emergency Medical Services Department. In addition to having served as a firefighter and station officer, he has been a fire instructor, Public Information Officer, Battalion Chief, Executive Officer to the Fire Chief, Fire Marshal, and Operations Shift Chief, Victor served as the Deputy Chief of Emergency Operations prior to his departure from the department in 2010. He authored a chapter in Fire Engineering's Handbook for Firefighter I and II on EMS in the Fire Service.

79. Practicing as a Student of Fire: Local actions to support global issues

Presenter(s): Kelsy Gibos MSc., Wildfire Management Specialist, Edson Wildfire Management Area, Forest & Emergency Response Division, Alberta Environment & Sustainable Resource Development

Additional Author(s):
Roger Strickland, Senior Instructor, Country Fire Authority
Rod Stebbing, Principle Consultant, Emtrain Fire & Community Safety Pty Ltd

Paul Gleason left a legacy of thinking firefighters whose safety was linked to their application of fire science principles at the fireline. His vision fostered experiential learning where knowledge was passed from those bearing battle wounds of near-misses to those just beginning their inherently risky wildland fire career.

Australian wildfire educators Roger Strickland and Rob Stebbing have co-founded a unique community of practice called Students of Fire (SoF) under the auspices of IAWF. Driven by their personal experiences with a near-miss tanker burnover, SoF was developed as a platform for sharing. SoF is about activity and continual improvement; it is about local action to learn about a global issue. It builds connections across the wildfire community and a dialogue between firefighters, researchers, local government authorities, educators, and all those with responsibilities in wildfire.

SoF recognizes the value in informal sharing of personal experiences; it is born from those in-camp-after-dinner reflections between strangers on what was supposed to happen, what really did happen and attempts to explain discrepancies. It arises from a need to fuzz out jurisdictional borders and a desire to challenge the science of fire behaviour prediction. SoF is for thinkers; it is about inquiry and a search for understanding. It is a safe place to ask questions, to step outside of the boundary of the 'norm' and to challenge the use of terms like 'unprecendented', 'unexpected', 'extreme' and 'unforseen'.

This presentation outlines the mission of the Student of Fire project and provides details on how to participate at the workplace level. It is delivered by a practicing SoF who will provide tips to help ignite mindfulness about the relationship between science and safety and encourage calibration based on personal experience.

SoF highlights that the language of fire amongst those who observe it is universal. Comradery is widespread amongst personnel whether it is national or international boundaries that are breached by a spreading fire. Emergency management environments change over time and space, but the mathematics of fire spread and the feeling of heat on skin will remain the same.

Keywords: Students of Fire, Paul Gleason, experience-based learning, global fire community, lessons learned

Bio: Kelsy Gibos is a fire behaviour specialist who has observed and studied fire behaviour in Canada, New Zealand and Australia. Her experiences abroad have ignited an interest in sharing lessons learned especially with regards to the application of science at the fireground. Her focus is in finding a way to translate complex, peer-reviewed scientific information into practical, on-the-ground feet-in-the-ash applications. She currently resides in Edson, Alberta, Canada with her partner Travis and their two Australian cattle dogs.

RESILIENT RESPONSES

80. Building agency and community capacity for successful engagement – lessons learned from agency programs in Victoria, Australia

Presenter(s): Tamara Beckett, Manager Engagement, Fire and Emergency Management, Department of Environment and Primary Industries
Owen Gooding, Team Leader - Vegetation Management, Fire and Emergency Management, CFA

In Victoria, Australia, two agencies have responsibility for management and prevention of bushfires – one on public land and one on private land. The Department of Environment and Primary Industries and the Country Fire Authority have different legislation, different structures, different cultures and different relationships with communities, but they have one common objective: to minimise the impact of bushfires to the Victorian community.

Fire management agencies around the world recognise the need to engage authentically with the communities they serve in order to gain support for agency fuel reduction programs and to motivate communities to undertake wildfire risk mitigation works on land for which they are responsible.
In this paper, we will examine the effect of the Victorian community's support for and understanding of bushfire management and risk mitigation techniques, focusing on the fuel reduction burning program across both private and public land. Victorian agencies have each implemented a number of different approaches informed by various research. These approaches include knowledge transfer and knowledge building processes, traditional information-based engagement or education and application of community development principles to build community capacity for meaningful engagement. We will discuss the traditional and novel approaches undertaken by each agency individually to engage at the peak body and local community level, and contrast this with examples of where the agencies have worked together to deliver mutually beneficial outcomes.

Despite the differences in the agency legislative context, jurisdiction, and the sectors of the community engaged, program evaluations show there are common mechanisms which characterise success.
This paper examines the Victorian agency programs in the light of the evidence from the evaluations and social research. We conclude that there is a compelling need for fire agencies to adopt a knowledge-built approach to achieve a broad and sustained reach of fuel reduction programs.

Keywords: community engagement, risk, impact, bushfire management, knowledge building

Bio: Tamara has been with the Department of Environment and Primary Industries for five years, undertaking a variety of roles with complex stakeholder and community interaction, as well as having an emergency response role. Tamara has spent the last two years leading a team tasked with designing and driving cultural change within DEPI and the Victorian Emergency Management Sector to work more effectively with communities, and build capacity in communities with high fire risk to enable their meaningful input to planning and mitigating major bushfires.

Owen Gooding heads up the Vegetation Management program for the Country Fire Authority (CFA) in Victoria, Australia. The program provides technical expertise, planning and legislative compliance support for CFA volunteer fire brigades that undertake fuel reduction works. Prior to this role Owen worked in the regulatory setting for new developments in high wildfire risk locations. Owen has been involved in CFA's post incident analysis of house losses in major wildfires and was a member of the national task force that researched the Black Saturday losses in 2009. Owen's

special interest is the social aspects of fuel reduction treatments.

81. Climate Wise Communities: enhancing traditional wildfire risk management using a community multi-hazard resilience program in Sydney, Australia

Presenter(s): Jennie Cramp, Technical Officer – Bushfire, Ku-ring-gai Council

Additional Author(s):
Dr Jenny Scott, Sustainability Program Leader, Ku-ring-gai Council

A trend of increasing wildfire frequency and severity poses serious risks to people, their built environment, the economy and biodiversity. Recent experience suggests the effectiveness of traditional wildfire hazard management is inadequate especially given more intense and catastrophic fire weather. Policy developments in Australia have yet to acknowledge the limitations of traditional wildfire hazard reduction measures. An appreciation of the social dynamics involved in wildfire preparedness, is essential in understanding why traditional hazard reduction measures are failing to manage the risks.
The Ku-ring-gai area is one of the most wildfire vulnerable communities in NSW, Australia due to local climate, extensive wildland-urban interface and population density. To enhance traditional wildfire risk management, Ku-ring-gai Council adopted a shared responsibility approach and implemented the Climate Wise Communities (CWC) program. Through facilitated interactive activities and scenarios, the CWC program enables residents to assess their vulnerability to wildfire and other extreme weather events at a personal, property and neighbourhood level to plan for improving resilience.
In collaboration with key emergency management agencies, Government, and not-for-profit organisations, a series of workshops were delivered to high risk groups and services in Ku-ring-gai. Over 220 participated including wildland-urban interface neighbourhoods, residents involved in local fireguard, resident action groups, volunteer groups including Bushcare and social support services. A focus has been seniors and early childhood services in which a multi-hazard approach was trialled. Future workshops planned include business continuity planning, landscaping and retrofitting, focus groups for women and non-English speaking residents, writing a survival plan and follow-up action plans with aged-care services.

In terms of wildfire, Council believes the CWC program assists in improving household preparedness and decision-making capacity before and during a wildfire. Participation in this program can influence an individual's decision regarding triggers for timely evacuation, property resilience and their capacity to stay and defend. The program also seeks to strengthen communication networks before, during and after a wildfire event to keep the community better informed, improve responses and aid recovery.
The authors propose that utilising social dynamics in wildfire safety adds some latitude and depth to current wildfire and other extreme weather risk management.

Keywords: wildfire preparedness, shared responsibility, resilience, interactive, networks

Bio: Ms Jennie Cramp has a background in the biological sciences and is a volunteer fire fighter with the New South Wales Rural Fire Service. She has number of years experience in organisational strategic planning. Her current employment as the scientific officer for bush fire at Ku-ring-gai Council focusses on collaborating with fire agencies, land managers and the community to develop and implement strategic bush fire risk management programs including contributions to Council's ongoing work implementing the Climate Wise Communities program. In 2014, Jennie completed post graduate studies in bush fire management at the University of Melbourne to further her career in bush fire behaviour analysis.

82. Wildfire Resilience: The Development and Validation of the Bushfire Psychological Preparedness Scale (BPPS)

Presenter(s): Jessica Boylan, PhD Candidate, University of Western Australia

Additional Author(s):
Carmen Lawrence, Winthrop Professor, University of Western Australia

Wildfires can be stressful events requiring individuals to demonstrate a level of psychological resilience to make fast and accurate safety-based decisions to reduce risk to themselves and others, to their property and surrounding

environment. For this reason, psychological preparedness is an integral part of preparing for a wildfire. Despite this, psychological preparedness continues to be an under-researched area in the wildfire context, partly because of the difficulty in conceptualizing what it means to be psychologically prepared and therefore develop a tool to quantitatively operationalize it.

Without such a tool, there are no clear criteria by which to judge whether and how well individuals are psychologically prepared. As a result, there is little evidence about the predictors and outcomes of psychological preparedness, which could lead to the development of effective interventions to improve overall preparedness and reduce the risks posed by wildfires. Therefore, the primary objective of this research is to fill this gap and develop a reliable and valid measure of wildfire psychological preparedness which can be used in the research setting to develop and evaluate theories that are dedicated to shaping and promoting wildfire safe behaviors.

In this presentation, the results from a series of studies performed to develop and validate the Bushfire Psychological Preparedness Scale (BPPS) will be shown. The conceptual model, which is based on the protective factors of psychological resilience, and developed to guide the generation of measurement items will be discussed. The review of items by subject matter experts will be shown and the results from a pilot study will demonstrate promising and preliminary evidence that the Bushfire Psychological Preparedness Scale is a reliable and valid measure of wildfire psychological preparedness.

Keywords: wildfire, psychological preparedness, resilience, measure development, BPPS

Bio: Jessica completed her Bachelor of Psychology with honours at Curtin University in 2007. She commenced her Master of Psychology (Industrial & Organizational) at the University of Western Australia in 2009, completing the coursework component in 2013. Following two years of full-time work and part-time study, Jessica returned to the university on a full time basis to commence her PhD in 2011. Jessica formed part of the Bushfire CRC PhD student cohort in the School of Psychology at the University of Western Australia. Broadly, Jessica's PhD focuses on conceptualizing and operationalizing bushfire psychological preparedness.

83. Increasing Community Resiliency by Promoting the Use of Prescribed Fire in the Southeastern United States: The Fire in Southern Ecosystems Program

Presenter(s): Adam Kent, Ecologist, Normandeau Associates, Inc.

Additional Author(s):
Christine Denny, Principal Scientist, Normandeau Associates, Inc.
Jim Brenner, Fire Management Administrator, Florida Forest Service

An important obstacle to prescribed burning has been the lack of effective, coordinated, targeted fire education programs. Because financial support often results from public support, it is important to have a constituency that supports prescribed fire. In general, residents of the southeastern United States do not have a good understanding of prescribed fire or of the natural role of fire. Understanding these two concepts is important for the public, especially in Wildland Urban Interface areas where wildfire risk is high.

Many Florida fire managers believe Florida's severe wildfires of the late 1990s resulted from fuel buildup due to public resistance to prescribed fire. At that time in Florida, very few public school teachers and a smaller number (than might be expected) of park and nature center staff were regularly teaching about fire. The Fire in Southern Ecosystems (FISE) curriculum was started in Florida as a Florida-specific program to provide educators with the background, knowledge, and skills they need to teach about fire. FISE is a free workshop and curriculum package for educators of all types. The goal of the FISE program is to engender a citizenry that supports prescribed fires. The program is expanding from Florida to other states in the Southeast and can be used as a model for fire education programs in other regions as well. Evaluation is key to improving the FISE program over time. A needs assessment was conducted and received input from more than 1,200 educators. Participants show statistically significant changes in knowledge and attitudes about fire immediately after, and even years after, attending a workshop. During more than 150 workshops in the past 15 years, this program has reached 95% of the school districts in Florida and more than 3,000 educators, with a potential impact of more than 1 million people. Workshops are coordinated and taught by Normandeau Associates, Inc., for the Florida Forest Service. The FISE curriculum and teaching resources are available to download for free from www.fireinsouthernecosystems.com.

Keywords: Fire, Southeast, Southern, Ecosystem, Education, Program, Community, Resiliency, Teach, Educator
Bio: Adam Kent is an Ecologist with Normandeau Associates with more than 20 years of professional experience as a wildlife biologist. His background includes securing funding for fire teams across the Southeast and instructing on fire ecology. Adam has written management guidelines, management plans, and educational materials that incorporate fire.

84. INSIGHT + ACTION = RESILIENCE Proven Results from Wollombi Australia

Presenter(s): Glenn, O'Rourke, BSc(Hons) MBA, Deputy Captain Wollombi Brigade, New South Wales Rural Fire Service

A strategic and targeted approach to building resilience in the high bushfire (wildfire) risk community of Wollombi has generated remarkable results beyond that of research findings reported by the Australian Bushfire and Natural Hazards Cooperative Research Centre [BNHCRC] between 2009 and 2014.
Nestled in a rugged valley north west of Sydney, the small rural village of Wollombi is bordered on all sides by extensive eucalypt forest. The risk of bushfire is high, with major fires occurring in 1994, 2001, 2002 and 2004.

INSIGHT - community resilience insights arising from research.
A review of findings of BNHCRC research conducted to investigate community responses to bushfire threat over seven studies between 2009-2014 reveals generally low levels of risk perception, planning and preparation to survive bushfire. Findings provide a clear focus for 'engagement action', and recognition of shared responsibility required to improve bushfire survival.

ACTION - responding to what we have learned from the research.
In 2005, the volunteer Wollombi Rural Fire Brigade established the Wollombi Valley Bushfire Safety Program. Driven by constant measurement and community feedback the program has continued to innovate, developing a series of integrated risk based initiatives specifically targeted at closing the survival planning, preparation, decision-making gaps highlighted in the BNHCRC research.

RESILIENCE - building stronger community resilience and a better prepared community.
The Wollombi model of integrated risk based community engagement has not only achieved significant increases in community bushfire risk awareness [from 0% to 73%], preparation skills [from 34% to 94%], decision making [from 7% to 90%] and planning [from 9% to 95%], but has most significantly achieved measured tangible behavioural change in both the 'preparation for' [91% prepared/well prepared/very well prepared] and 'response to' bushfire [79% plan implementation] as evidenced by the findings of locally conducted research. Most significantly, 51% declare they have a written Bushfire Survival Plan compared 5.4% of people surveyed by the BNHCRC.

CONCLUSION
The Wollombi experience presents strong proof that a strategic and targeted approach to community bushfire safety works…. achieving tangible behavioural change and significantly improved community resilience. The Wollombi Rural Fire Brigade program is a leading example of a highly effective localised research based program driven by volunteers.

Keywords: Wildfire; Community Safety; Volunteer Program; Resilience; Survival Planning and Decision Making

Bio: Glenn is Deputy Captain and Community Safety Officer of the volunteer Wollombi Rural Fire Brigade, of the New South Wales Rural Fire Service, Australia. He holds the NSW RFS Commissioner's Commendation for Service. Glenn commenced service as a volunteer over 30 years ago and is passionate about community bushfire safety. Over the past 10 years he has driven the development and implementation of what is regarded as cutting edge, best practice community engagement.
Professionally, Glenn is a strategist with an international construction company, and has a background in business strategy, change management and stakeholder communications. Glenn holds a Bachelor of Science (Honours) and Master of Business Administration.

85. Listening for Resilience: Expert Fire Managers Share Crucial Experience

Presenter(s): Rebekah Fox, PhD, Assistant Professor, Texas State University

Additional Author(s):

Shanna Shultz, Graudate Student, Texas State University

Firefighting fatalities and property damaged by wildfire prompt reviews aimed at preventing similar events from occurring. The principles of high reliability organizing (HRO) have been used to view such unexpected events with the goal of trying to make sense of what happened (Keller, Weick, Sutcliffe, Saveland, Lahey, Thomas, & Nasiatka, 2004). An HRO perspective suggests that organizing occurs in environments where both the stakes and ambiguity are high, and the environment itself is constantly changing. Organizations that are adept at recognizing and dealing with small but potentially disruptive discrepancies in work practice are able to do so by practicing five principles: 1) preoccupation with failure: 2) wariness with simplification; 3) sensitivity to operations; 4) deference to expertise; and 5) commitment to resilience.

However, practitioners who agree to the value of an HRO framework often have difficulty applying it and teaching others how to cultivate it. Part of this difficulty, we argue, is due to the fact that there are few studies that explicitly identify language associated with the HRO concepts.

As a part of a larger knowledge management project, seventy-four interviews were conducted from 2006-2010 with fire managers knowledgeable in wildland fire management operations (Thomas, Leonard, Miller, &Carol. 2012). Each interviewee was asked to select "a significant fire management challenge that they had successfully worked through" in their careers. We will present the findings of a content analysis of these interview data including the topics, strategies, and personal experiences interviewees recall when asked about difficult times in their careers or times when they practiced resilience.

The second part of this presentation will discuss how interviewees communicatively constructed resilience by asking "In what ways does communication play a role in the construction of resilience?" (adapted from Buzzanell, et al., 2009). These data draw attention to the type of language used by individuals when they recall troubling events and how they "bounced back" from those events. The qualitative content analysis along combined with the rhetorical analysis allow us to examine not only what is discussed, but also how the topics are communicated, thus aiding in the praxiological development of HRO theorizing.

Keywords: Resilience, HRO, Deep Smarts Interviews

Bio: Dr. Fox's research falls into three categories 1) organizational rhetoric, with a focus on power in organizations, 2) health communication with a focus on the U.S. nursing shortage, and 3) the rhetoric of social movements. She has been published in communication journals and journals in related fields, such Environmental Communication: A Journal of Nature and Culture, American Journal of Nursing, and Society and Natural Resources (in-press). Dr. Fox has edited IAWF conference proceedings for the Human Dimensions, Safety Summit, and Fire Behavior and Fuels conferences. She is currently working on a Joint Fire Science Project grant studying radio communication.

86. Special Session Four: Comprehensive Wellbeing and Resiliency

Presenter(s):
Bequi, Livingston PTC, IHC, Regional Fire Operations Health and Safety Specialist, US Forest Service
Michelle Reugebrink, Regional Occupational Health and Safety Manager, US Forest Service

Never in all the decades of wildland fire has personal health and wellbeing been so critical to the success of the profession and personal lives of our fire personnel. With so many traumatic events ocurring on a regular basis, compiled with ongoing stress in the workplace and personal lives, many of our fire personnel find it hard to cope and move forward after a traumatic event. Comprehensive Wellbeing and Resiliency takes each participant on on a personal and introspecitve journey, focusing on the whole person to include physical, mental, emotional and spiritual wellbeing through an interactive and hands-on approach to life.

Keywords: Resilience, Wellness, Health, Fitness

Bio: Bequi Livingston was one of the pioneer women in wildland firefighting who started her career in 1979 on the Smokey Bear Ranger District for the US Forest Service. Her career has spanned over 25 years including, hotshot, engine crew, helitack, hand crew, assistant fire management officer, prescribed fire operations specialist and currently serving as the Regional Fire Operations Health and Safety Specialist in the Southwestern Region of the US Forest Service. Bequi

recently attended Duke University becoming a Certified Professional Integrative Health Coach and is also a Certified Personal Fitness Trainer.
Bequi Livingston is currently assigned to Human Performance, RD&A working as a Comprehensive Wellbeing & Resiliency Training Manager. Bequi started her 25+ year career in wildland firefighting in 1979 working in a variety of wildland fire crews including hotshot, helitack, engine, fire prevention and a variety of fire leadership positions including her recent job as Regional Fire Operations Health and Safety Specialist.
Bequi's passion and expertise is in the fields of fitness and wellness and currently certified as a Personal Fitness Trainer, Group Fitness Instructor, Duke University trained Integrative Health Coach and Human Performance Institute, Corporate Athlete Trainer and instrumental in the development of the Interagency FireFit program.

Michelle Reugebrink works for RD&A, Human Performance Health, Wellness, & Resiliency Manager. This is Michelle's 29th year with the USFS. Michelle is a Duke Professional Integrative Health Coach, member of International Coaching Federation & a Professional Executive Coach. Michelle is working on certification Teacher in Mindfulness-Based Stress Reduction. Michelle is a train to trainer Corporate Athlete.
2008 Baskin-Robbins & the National Fallen Firefighter Foundation named Michelle Reugebrink one of America's 31 Firefighting Heroes. This recognizes her for outstanding acts of valor, commitment to the ideals of community service, protection of life as a Forest Safety Officer and wildland firefighter. 2007 Michelle received Chief's award, for "Her Passion and Caring for Employee Safety & Well Being."

87. Special Session Five: Competency in Crisis

This special session is designed to move participants to a higher level of competency in crisis management by the use of case study, facilitated dialogues and interactive exercises. Learners will virtually visit the Southern France Crisis Center and experience a 2014 day of Corsican multiple crises (simultaneous wildfires, evacuations, village fires, main roads blocked and a fire engine rollover accident) through interactive media with some of the French operations leaders. You will see firsthand how they consciously use High Reliability Organizing processes to support competency during this multi-crisis day and learn how to bring the salient parts together to "up your game."

Competency in this context is an amalgamation of critical thinking, time pressure decision making, and of course leadership. You will have the opportunity to learn and practice new skills in a safe environment with expert guidance. A library of case studies, in addition to the Corsican crisis, will be available after the special session to demonstrate key learning concepts with Saddleback and Yarnell Hill fatality fires as well as other international incidents.

Keywords: HRO Implementation, Action Learning

Bio: Since 2012 C. FRERSON works as Civil Protection Advisor in the Ministry of Interior, General Directorate of Civil Protection and Crisis Management, at the Southern Inter-ministry Headquarters. He is responsible for planning and is head of the Zonal Emergency Operation Center. In this position, he covers all kind of risks in 16 counties with 22,000 firefighters and a population of about 9 million citizens. C. FRERSON has presented at several international conferences and has published some papers about crisis management.

Christophe FRERSON holds a Master's degree in "RISK and Crisis Management."
Since 1998, he has worked as an officer in several Fire Departments in various positions, such as, Battalion Chief, Head of Fire Station, Incident Commander, Air Attack Supervisor, designer and head of Research & Technology for operations. During his posting as head of R&T service, he was maintaining international and university partnerships to focus on, share or disseminate lessons learned.

SPECIAL SESSION SIX: KEEPING FIRE ON THE MOUNTAIN

Moderators:
Henry Bastian, US Department of the Interior, Office of Wildland Fire, Fire Ecologist,
Laurie Kurth, US Forest Service, Fire and Aviation Management – Fuels and Fire Ecology, Applied Fire Ecologist
Frankie Romero, US Forest Service, Fire and Aviation Management – Fuels and Fire Ecology, Fire Use and Fuels Management Specialist

Federal wildland fire policy identifies human safety as the first priority for fire managers. But beyond this, the priority-setting becomes more obscure. There are protection objectives and resource objectives, and given the scenario, these do not always align. For decades, we presumed that fire only had the capacity to destroy and should be eliminated, thus swift and decisive suppression of all fires was viewed as the solution. Experience has proven that simplistic ideal wrong.

Today we know that in many of our fire adapted ecosystems, fire is an important and even vital process that is needed to maintain the structure and function of these landscapes. It is also increasingly recognized that the practice of continued suppression of all fires in fire adapted ecosystems is a short sighted solution with long-term consequences including predisposing these areas to higher intensity fire in the future thus, transferring the risk of harm to future generations. The tension between the benefits and the impacts from fire creates a challenging decision environment for land managers. This special session will explore some of the realities of managing fire on landscapes where not everything needs protection from fire and where decision makers at all levels are faced with the complexities of balancing short and long-term risks to people, communities, and natural resources. The goal will be to highlight real-world situations and explore the complexity of this resource management challenge.

We'll set the stage with a brief look at the history of beneficial wildfire on the landscape; amounts, trends, ecological effects, and the evolution of policies and practices. We will then take a look at research related to the influences of external and internal pressures on wildland fire management decision making followed by a series of practitioners presenting case studies where these dilemmas were encountered at the local, geographic area, and national levels. The session will conclude with a moderated Question and Answer session allowing audience members an opportunity to ask their own questions of the invited presenters.

88. How We Decide: Research on fire management decision making and risk
Presenter: Sarah McCaffrey

89. Defining the Risks and Opportunities: An Agency Administrator's Perspective
Presenter: Chuck Mark, Salmon-Challis NF, Forest Supervisor

90. Making the Tough, but Right Decision: Review of the 2014 Fire Season on the Kaibab National Forest
Presenter: Art Gonzales, Kaibab NF

91. Decision Making for Multiple Fires, with Multiple Objectives, Across Multiple Units: A Geographic Area Fire Managers Perspective
Presenter: Patti Koppenol

92. Using wildland fire to protect, maintain, and enhance resources: A National Perspective
Presenter: Dick Bahr

ASSESSING AND MITIGATING FIREFIGHTER RISK

93. Efficient calculations of optimum paths and travel time for firefighters

Presenter(s): Joaquin Ramirez

Additional Author(s):
Santiago Monedero, Main Researcher, Technosylva
Alicia Ruiz Acero, Wildfire Analyst at UNAP, GEACAM

There is a urgent need to better know the crews mobility on the ground. Main studies by Butler et al (2000) Dakin (2002) and Baxter et al (2004) point out the need for a wider analysis of data to start creating a wide use model.

A tentative list of variables that influence include crew (type, number of personnel and condition, differences during fire season, accumulated hours), terrain (vegetation, transitability, slope: grade and length, aspect) and weather conditions among others.

This work presents an implementation of existing travel rates values by Butler integrating the concept of evacuation time area, as presented by Frier et al (2013). The system allows the data assimilation of real time travel rates, and is going to be implemented during 2015 fire season by Castilla La Mancha Wildfire Agency (GEACAM). The extremely fast calculations allow the use in the field through portable devices, providing a better understanding of the crews' performance and an initial framework to capture GPS based tracks to support next generation of travelling modelling.

Keywords: travel rates, safety zone, crews mobility, GPS tracking

Bio: PhD on Forestry and Geomatics from the University of Leon.Co-Director of the first European MsC program on Wildfires (www.masterfuegoforestal.es) where he teaches "Geotechnologies on Wildfires". His applied research is focused on wildfire modelling and geo-tools.
He is the principal of Technosylva, (San Diego), where he develops tools for operational support, as Wildfire Analyst, first wildfire simulator oriented to support real time operations, and fiResponse, a complete wildfire management system used in European agencies since 1997 (www.wildfireanalyst.com www.firesponse.com).
He has also leaded Risk Assessments of different Spanish regions and in the US, as the Wildfire Risk Assessment for MC Camp Pendleton.

94. A comprehensive survey of the long-term health of current federal wildland firefighters

Presenter(s): Erin Semmens, PhD, Postdoctoral Fellow, University of Montana

Additional Author(s):
Joseph Domitrovich, PhD, Physiologist, USFS Missoula Technology and Development Center
Kathrene Conway, Computer Systems Analyst, University of Montana
Curtis W. Noonan, PhD, Associate Professor, University of Montana

Background: Over 15,000 men and women participate in wildland fire suppression activities every year, working long shifts over many days under extreme conditions. Wildland firefighters (WLFFs) are exposed to air pollutants, noise, heat, intense exertion, stress, and disrupted sleep, all of which have established long-term health effects. Although the body of literature describing the health consequences of structural firefighting is growing, the impact of sustained, repeated occupational wildland firefighting exposures over multiple years on the long-term health of WLFFs is unknown. Methods: Over 500 current WLFFs completed a mail survey of wildland firefighting occupational experience, chronic health conditions, behaviors, and demographic characteristics between March and November, 2014. Our primary objective was to evaluate cross-sectionally the relationship between wildland firefighting experience and the prevalence of several specific, self-reported health outcomes. Results: Seventeen percent of respondents were female, eight percent were Hispanic, and the vast majority (91%) was Caucasian. Respondents were, on average, 41 (standard deviation, sd:14) years of age and had seventeen years (sd: 12) experience in wildland fire. In logistic regression analyses adjusted for age, gender, and race, we observed that each additional year of occupational experience in wildland fire was associated with 4.7% (95% CI: 1.5%, 8.0%), 16.8% (95% CI: 1.9%, 33.8%), and 3.2% (95% CI: 0.1%, 6.3%) greater odds of prevalent hypertension, heart arrhythmia, and hearing loss, respectively. No increased risk of myocardial infarction or asthma in relation to wildland firefighting experience was observed in survey respondents. Conclusions: Although it is not known if these findings can be generalized to all WLFFs, in this sample of WLFFs who responded to a survey of their long-term health, we observed significant relationships between a longer duration of wildland firefighting experience and self-report of two established risk factors for cardiovascular events. In addition, a higher prevalence of self-reported hearing loss was linked to a greater number of years in wildland fire. The influence of behavioral factors on these associations as well as more studies examining objective measures of cardiovascular health in a larger population of WLFFs are warranted.

Keywords: long-term health, epidemiology, wildland firefighter survey

Bio: Erin Semmens is a Postdoctoral Research Fellow in epidemiology in the University of Montana's Center for Environmental Health Sciences in Missoula, Montana. She graduated from Duke University with a degree in Biology and Political Science, and earned both an MPH in Environmental and Occupational Health Sciences and a PhD in Epidemiology from the University of Washington's School of Public Health. Investigating the long-term health impacts of wildland firefighting and evaluating interventions designed to improve respiratory health in older adults and in children living in homes with wood stoves has been the focus of her research.

95. Quantifying Aviation Accident Risk in Wildland Fire Suppression

Presenter(s): Crystal S. Stonesifer, Biological Scientist, USFS Rocky Mtn. Research Station

Additional Author(s):
David E. Calkin, Research Forester, USFS Rocky Mtn. Research Station

Matthew P. Thompson, Research Forester, USFS Rocky Mtn. Research Station

Wildland fire suppression is a high-risk enterprise. This is particularly true for those individuals engaged in aviation operations since aviation-related accidents comprise a large share of historical firefighter fatalities in the United States. Decision support and risk management tools can help fire managers weigh the complicated tradeoffs involved when additional personnel risk is accepted in order to meet wildfire management objectives. However, there is currently limited understanding of the operational factors that lead to aviation accidents in particular, and it is unclear how local fire managers can mitigate the risk of an aviation accident once resources are in the air. To work toward addressing this need for informed risk-based decision support, specifically with respect to aviation use in fire suppression, we developed the Aviation Exposure Index (AEI). The AEI is an incident-level metric that can inform fire managers of the aviation accident expectation based on historical accident rates (10-year average) and observed aviation resource use. We focus on large wildfires in the United States in 2012 to demonstrate the development and applicability of this index. Results of this test year are presented by individual incident, aircraft type (tanker, fixed wing, or helicopter), and incident jurisdiction. While we feel that this index likely has the most value in terms of a real-time decision support capacity, there is also value in post hoc analyses of wider scale spatial or temporal trends to identify particular conditions where high levels of aviation exposure may occur. Here, we present results of these regional and seasonal analyses and discuss the potential implications.

Keywords: aviation exposure, decision support, risk management

Bio: Crystal Stonesifer is a research analyst in the Human Dimensions program with the US Forest Service Rocky Mountain Research Station in Missoula. Her background is in hydrologic modeling and fire science. She's been with the station for nearly 4 years. Her research mainly involves investigating and analyzing resource use in fire suppression, with an emphasis on aviation.

96. Bald Sisters Fire

Presenter(s): Brian Bishop

Answer the right question. The Bald Sisters fire started on 8/1/2014. There were three confirmed smokes in the upper 1/3 of the same drainage, within a steep Inventoried Roadless area (USFS). Access was extremely difficult with lookout points and safety zones in short supply, if not non-existent.

One smoke began to grow and exceed Initial Attack capabilities, more due to terrain, multiple fires in one drainage, and access.

It was quickly recognized that, other than Air Resources, indirect action was the best choice.
The management of the fire progressed from IA, type III IMT, and to a Type II IMT (by 8/7) with a National Incident Management Organization (NIMO) assigned.

As an analysis was completed, during the first 12 days, it was determined that a low probability of the fire challenging or exceeding planned indirect lines existed. Great consideration was weighed between risk and exposure to Firefighter's verses physical resource values. The strategy to monitor the fire, within constructed indirect lines, was decided upon.

The fire was returned to Type III status on 8/24 and Type IV on 9/23 with the fire being deemed out on 11/24/2014.

Throughout the duration evaluating risk and exposure to firefighters remained the priority. Some direct actions were taken, however, the well being of firefighters remained priority. The main consideration, to not engage in direct attack, was steep timbered terrain that made establishment of escape routes and safety zones challenging and challenged the ability to extricate injured personnel.

Complexity revolved around a highly visible fire to local communities, steep difficult access, Wildland Urban Interface within 10 miles of the western perimeter, and educating firefighters with clear leader's intent. The constant of public perception or understanding the chosen course of action created a challenge for fire managers to stay connected to the public through the duration.

The question we tend to try to answer, in wildland fire suppression, is "Can or how can we fight the fire safely". Well the answer is yes we have and we can, that is proven every season, if we define the definition of safety on personal injury

rates. The real question to ask is "What is the risk and exposure to firefighters verses the resources we are trying to save". That was ask and challenged with the Bald Sisters fire.
Keywords: Manageing Firefighter Risk

Bio: Brian Bishop, District Fire Management Officer (USFS) is currently employed in Region 6 on the Malheur NF, Prairie City Ranger District as the DFMO since 2010. My career began in 1981 on the Mt. Baker Snoqualmie NF and has spanned five NF's and two Regions (4 and 6), although fire suppression assignments have taken me across the US. The bulk of my career has been spent in Fire and Fuels Management, with the exception of four and a half years in Timber Management, doing Timber Sale Preparations. This has included duties in Fuels Operations, Fuels Planning, Fire Suppression, Prevention, and Detection. I have also served on Type 2 Incident Management Teams.

97. De Soto Aviation Incident

Presenter: Danny Bryant, Acting Staff Officer; Fire, Safety, Lands and Minerals, Forest Service, National Forests in Mississippi

In this discussion, the speaker will provide a brief overview of the Aviation Incident of March 30, 2015 that occurred during the Florida Road prescribed burn on the De Soto Ranger District. The discussion will begin with some background information on the organization structure and Prescribed Burning programs in R8 and on the National Forests in Mississippi. We will then describe the Rx program on the De Soto including the issues and complexities. The discussion will then describe the planning and implementation of the Florida Rd prescribed burn, the accident itself and the response that followed. We will then focus on the main points for this discussion, the lessons learned. Points will include; the successes that occurred before and during the incident, the response phase, lessons that we've identified so far and how we can share this information. Main topics:

A. During a Forest Leadership Team meeting last year, we conducted a sand table exercise where the scenario involved a helicopter going down during a prescribed fire on the Forest. The scenario and following AAR lasted only about 2 hours but it allowed the participants to be better able to adequately manage the situation when it actually occurred.
B. The burn boss briefing before each prescribed burn, that involved aerial ignition, included detailed instructions to respond to an aviation mishap. This provided leaders intent and ensured that responders were able to act quickly.
C. Having experienced, capable Dispatchers with local knowledge in place.
D. De Soto being registered as "First Responders" sped up the request for Life-flight.

This presentation will then close with the next steps for the National Forests in Mississippi.

Bio: Danny graduated from Mississippi State University in 1984 with a BS degree in Forestry. He went to work for the Mississippi Forestry Commission in 1985 and worked as County Forester in several different counties over the next 13 years. In 1998, he moved into the Forest Protection Division in the State Office and became Fire Training Officer in 2000. Bryant was assigned as the Director of the Southern Regional Fire Training Center upon it's opening in March of 2005. In 2006, Bryant joined the USDA Forest Service as Assistant Fire Management Officer for the National Forests in Mississippi where he was in charge of the fuels, training and qualifications programs. In 2008, he accepted the Regional Fire Prevention and Coop Fire Program Manager position located in the Regional Office in Atlanta, GA. In 2009, Bryant returned to the National Forests in Mississippi. Danny became involved in western fire details in 1989 and worked up through crew and operations single resource positions. He has worked as Division/Group Supervisor on the Southern Area Incident Management Team (Red Team) since 1999. Bryant became certified as a Type 1 Operations Section Chief in 2006 and now serves as primary OSC1 on the Blue Team. He is also qualified as an Incident Training Specialist, ICT3, RXB2, Type II IC (T) and Type II Safety Officer (T).
Danny currently lives in Madison, MS with his wife and two boys ages 18 and 20.

98. Human Dimensions in Wildland Fire Management - Perspectives on the Past, Thoughts on the Future

Presenter: Tom Harbour, Director of the Fire and Aviation Management Program, US Forest Service.

Bio: Tom Harbour's first experience with wildfire was firefighting in central California in 1970. Since then, Tom has been involved in wildland Fire and Aviation Management his entire career. Beginning as a firefighter, Tom has had opportunities to fight, prescribe, and manage fires across the United States and internationally. His emergency management experiences have included fires, hurricanes, earthquakes, riots, floods, and other types of disasters all across America. His prescribed fire experience includes opportunities across the United States. He has been a Burn Boss, an Incident Commander, and Area Commander at the highest levels of complexity. He has a Bachelor of

Science degree in civil engineering from the University of California Davis and a Bachelor of Science degree in forest management from Washington State University. He graduated summa cum laude from the University of California at Davis and with Presidential Honors for a 4.0 GPA from Washington State University. He has done post-graduate work at the JFK School of Government, Harvard University and the Kenan-Flagler School of Business at the University of North Carolina. He served with faculty and leaders at the Marine Corps University, Quantico, Virginia. The US Forest Service Fire and Aviation Management program employs over 10,000 firefighters and has a budget over $2 billion (US). He has been happily married for over 35 years, and is a proud Father and Grandfather.

RISK

99. Marrying Strategic and Tactical Risk

Presenter(s): Ivan Pupulidy

Additional Author(s):
Matt Carroll
Curtis Heaton

The espoused goal of Strategic risk management is to be objective in the quantification of risk based largely on probability and severity (or consequence). It utilizes statistical tools and processes, base rates, and values, which can be assigned to hazards and calculated to allow for the prioritization of risks. Strategic risk assessment ultimately delivers in a prioritization that results in a decision regarding continuation, change or abandonment of a plan – in other words in a go/no-go decision. The basis of this decision is based on estimated exposure(s) compared against value(s) at risk. The calculation of strategic risk can become subjective if large data sets are not available. In this case the valuation of risk must rely on the intuitive, or best, guess of those empowered to create the assessment. Risk assessment is an anticipation of the future and as such will always have some inaccuracy – or it would not be risk.

The subjective nature of risk is further increased when the mission is assigned to tactical operators, because of the complexity of tactical operations. The subjectivity is more prevalent at the tactical level – there is a greater reliance on individual experience and experiential bias. Experiential bias is a natural tendency of people to normalize risk, which results in lower than actual value being placed on probability and/or consequence. Tactical risk management, therefore requires a process less tied to probability and consequence.

Understanding the difference between strategic and tactical risk management allows for a dissection of the one-size-fits-all risk management process to address the vulnerabilities associated with each level. At the strategic level we must acknowledge the fragility of our predictions and capitalize on opportunities to build adaptive capacity and margin for tactical operators. At the tactical level we must acknowledge the impact of the myriad conditions influencing risk management decisions, like human performance, biases, group and organizational pressures, etc. in order to build and maintain margin as conditions change.

Keywords: Risk, change, margin

Bio: Ivan Pupulidy is the Director of the USFS Office of Learning. In 1995, Ivan became a USFS Lead Plane Pilot and later a Regional Aviation Safety Manager. Ivan completed several internationally recognized programs in safety program management and accident investigation and is currently completing a PhD program at Tilburg University in the Netherlands. Ivan also flew HU-25 Falcon Fan-Jets at Coast Guard Air Station Corpus Christi, Texas and subsequently HC-130 Hercules aircraft, at Air Station Sacramento. Following the US Coast Guard, Ivan flew for the US Air Force Reserves in Iraq and Afghanistan and humanitarian support missions throughout central Africa.

100. The Incident Risk Console (RisC) – A Risk Assessment Synopsis for Wildland Fires

Presenter(s): Lisa Elenz, Deputy Program Manager, Wildland Fire Management Research Development & Application program, Rocky Mountain Research Station, US Forest Service

Additional Author(s):
Thomas Zimmerman, Senior Wildland Fire Consultant, Tom Zimmerman Consulting
Sean Triplett, Geospatial Manager, US Forest Service Fire and Aviation Management
Morgan Pence, Fire Application Specialist, US Forest Service Wildland Fire Management RD&A

Mitch Burgard, Fire Technology Transfer Specialist, US Forest Service Wildland Fire Management RD&A
Jill Kuenzi, Geospatial Coordinator, US Forest Service Fire and Aviation Management
Wildland fire complexity is increasing dramatically and presenting difficult problems and concerns for wildland fire management agencies. To improve decision-making and management capability, managers need more and better information about changing fire dynamics. Numerous information management systems exist and others are under development to provide improved wildland fire information, but systems providing risk assessment information are currently lacking. As a result, the US Forest Service National Director of Fire and Aviation asked if a new system to access and display such information from a variety of sources could be designed. The Incident Risk Console (RisC), a data analytics dashboard and business intelligence tool for wildland fire decision makers, was developed to provide national fire program managers with relevant fire information for emerging and complex ongoing wildfires. RisC information goes beyond available fire statistics and includes specific calculated information and indices that afford a visual risk assessment synopsis for wildland fires, an early alert/risk assessment for potential problem areas, and an overview summary of national and regional incidents. RisC includes eight specific risk attributes that summarize a range of conditions and activities on a fire-by-fire basis. These are: values Inventory, jurisdictions, significant fire potential, relative risk, suppression capability, aviation exposure, modeled values at risk, and modeled suppression effectiveness. The initial Incident Risk Console represents the transformation of an idea into an actual system. The 2014 fire season allowed for a test and an evaluation of its applicability. It was found to have specific value in providing new information useful in: clarifying the overall fire situation, understanding individual fire dynamics, and improving understanding of the effects of management decisions.

Keywords: risk assessment, information technology, decision-making

Bio: The WFM RD&A provides the latest research to the field through the development of tools, training, and by providing decision and analysis support. Until fall 2009 she was the FMO at Grand Teton National Park, previously working as the AFMO. She worked seasonally on crews and engines at Grand Canyon and Yosemite National Parks until she was hired permanently 1994 working in suppression, prescribed fire, fuels management, structural fire and emergency operations. She graduated from college in with a General Chemistry Degree, minoring in Mathematics and Nutrition from Northern Arizona University.

101. Developing a strategic wildfire risk assessment tool for the UK rural-urban interface

Presenter(s): Julia McMorrow, Senior Lectuer in Remote Sensing and NERC Knowledge Exchange Fellow, University of Manchester, UK

Additional Author(s):
Aleksandra Kazmierczak, Lecturer in Human Geography and Planning, Cardiff University, UK
Jonathan Aylen, Senior Lecturer, Manchester Business School, University of Manchester, UK
Rob Gazzard, Adviser, Technical Guidance, Forestry Commission England
James Morison, Programme Group Manager, Forest Research, UK
Andy Moffat, Honorary Research Fellow, Forest Research, UK

Wildfire is now on the UK National Risk Register, creating a need for improved policy and operational approaches to manage wildfire threat to vulnerable communities in the urban-rural interface. Government departments require a strategic tool to quantify the risk, hazard and impacts. Operational managers need to be able to identify areas of high wildfire threat which are adjacent to vulnerable communities as priorities for fuel management and evacuation by the emergency services.
Wildfire Threat Analysis (WTA) is a GIS-based tool which sees threat as a combination of three modules: Risk of Ignition (RoI) of vegetation fires; Hazard of fire spread; and Values at Risk (VaR), or assets potentially affected. It has been applied at a national and regional scale in New Zealand. We present results from a 6-month scoping study carried out by the University of Manchester and Forestry Commission England to investigate the feasibility of applying the WTA approach at a local scale in the UK.

The study area was a 11x12 km forest-urban interface area in South East England, where a significant wildfire occurred in April-May 2011. VaR and RoI modules were successfully co-produced with local stakeholders, including foresters, fire fighters, emergency planners, property owners, infrastructure managers and environmental experts. We used a Delphi method and Analytic Hierarchic Process, combined with spatial analysis of recorded vegetation fires in relation to causal factors. The RoI module was based on: proximity to built-up areas, roads and footpaths; land accessibility status; and land cover as a proxy for fuel type. The VaR map was developed by combining values for three themes: human

vulnerability; property and infrastructure; and ecosystem services. Human vulnerability and ecosystem services were novel elements not included in New Zealand's WTA.
A hazard module could not be developed due to lack of suitable fire climate data, but the Prometheus fire spread model was used to simulate fire perimeters and estimate actual and avoided losses. We highlight where further research is needed for WTA to become a strategic planning and operational tool for the UK. We recommend a nested WTA approach: national scale to identify hotspots for subsequent landscape-scale analysis.

Keywords: rural-urban-interface, GIS, wildfire threat, Swinley Forest fire, UK

Bio: Julia is a physical geographer and Senior Lecturer in Remote Sensing at the University of Manchester (UK). She holds a nationally-funded Knowledge Exchange Fellowship, leading the Knowledge for Wildfire project. Previously, she led the FIRES seminar series – fire interdisciplinary research on ecosystem services. As a member of the England and Wales Wildfire Forum and other national fire-related groups, she works closely with the Fire Services, land managers and other stakeholder communities to help provide evidence-based recommendations on wildfire policy. Her action research includes using satellite and Fire Service data to analyse spatial and temporal patterns of UK vegetation fire risk.

102. Reducing the Risk of High Intensity Prescribed Fire

Presenter(s): Rick Arthur

The use of prescribed fire is one of the most valuable tools in the wildfire managers toolbox. It can be used as part of an overall strategy for fuel reduction, landscape or ecosystem renewal, creating fuel breaks for future suppression strategies, etc.

As valuable as prescribed fire is, it is a risk if something goes wrong, the results can be catastrophic. Failure is not an option. The loss of a prescribed fire even with minimal impacts can result in a loss of public confidence, the suspension of prescribed fire programs, etc.

Learning from escaped prescribed fires clearly has a role to play for any high reliability organization. Learning from previous programs and applying those lessons to future projects has aided in reducing the risks of prescribed fire. At the same time it is critical to look into the successful prescribed fires, understanding what has made them successful, and applying those concepts to the next prescribed fire is important as well.

We cannot stop there. Fire management agencies need to develop new approaches, new technology, and new systems to meet the challenges that the future brings to us. Prescribed fire offers the opportunity to develop a greater understanding of fire behaviour and fuels response at an applied level. It provides us with the time to develop and test new techniques and tools that can be refined and applied to wildfire operations as well.

This presentation briefly covers some new approaches to reduce the risk of prescribed fire developed as part of the prescribed fire program in Southern Alberta. One example is the use of a "fuel amendment" process to increase the flammability of fuels within the prescribed burn unit. Increasing the flammability of the fuels within the burn unit allowed burning to occur in lower indices with less severe weather conditions while still achieving high intensity fire. At the same time, fuels outside of the burn unit have limited fire response given the same weather and indices.

Bio: Rick started his career on a seasonal fire crew with the Alberta Forest Service in 1974. After graduating from NAIT as a Forest Technologist in 1975, he has worked in numerous positions across Alberta. He has worked on wildfire operations from British Columbia to Ontario, from Yellowstone to the Yukon. He is passionate about most everything he engages in, especially fire history and fire behaviour and uses these skills to reduce the threat of wildfire as well as to restore it to the landscape through the use of prescribed fire. Rick understands and appreciates that fire is the "Ecological Imperative".

103. Dutch Creek Mitigation Measures: Successes & Failures

Presenter(s): Bill Arsenault, Fire/Medic, Operations Lead, Gem County Fire-EMS

Additional Author(s):
Curtis Sandy, MD, Board-certified ER physician & EMS Medical Director

Mike Evers, Fire/Medic, MEDL, Colorado Springs Fire Department

Since the inception of the Dutch Creek Mitigation Measures, wildland fire personnel continue to mis-understand critical key concepts of full implimentation of the measures.

An overview of Facilitated Learning Analysis (FLA), Serious Accident Investigation (SAI), After Action Reviews (AAR) and Lessons Learned that have provided measured successful outcomes as well as failures will be presented. These will include cardiac/medical cases, motor vehicle accidents, aviation usage, and emergency response preparedness to the above related "incident within incident' planning.
Through discussion and reviews, the participant will gain further understanding of key elements needed to continue to decrease wildland fire fatalities.

Keywords: Dutch Creek, leadership, medical training, helicopters, short haul, EMS, EMT, Paramedic, medical guidelines, clinical leadership

Bio: Bill Arsenault is a 25 year veteran of emergency services. He has operated in wildland/structural fire, EMS, military, and law enforcement environments. In addition, presented at the 2011 IAWF Safety Summit. He is well-known throughout the wildland fire community as a medical response SME for all-risk incidents.

104. Rethinking the Fire Shelter

Presenter(s): Vincent H. Homer

Additional Author(s):
Carol Rice, Wildland resources, Consultant

A review of the statistics yields a questionable life safety record for shelter deployments in burn over and entrapment situations. USFS data indicates a wildland firefighter who deploys a fire shelter in true burnover conditions has a 4% chance of perishing, and a 50% chance of receiving 2nd degree or worse burns if s/he does survive. These statistics and concern over firefighter safety prompted an investigation into a new design from a perspective of thermodynamics and atmospheric survivability.
We present data and concepts surrounding the thermodynamics of protecting humans from untenable temperatures, heat flux exposures and hot, toxic gases. Current Fire Shelters rely heavily on reflecting radiant energy from fires but do not provide sufficient protection against convective energy transfer. It is common in burn-over situations for shelters to experience direct contact with flames and high velocity, hot gases. We conducted high heat flux (~80 kw/m2) tests involving flame impingement on original and new generation fire shelter materials as well as heat resistant fabrics used in protective garments. These show that at 80 kw/m2 the inside surface of original fire shelter material reaches 75˚ C in less than 10 seconds. The New Generation, two-layer shelter performs marginally better. The only way to delay the temperature rise within the shelter is to provide insulation and/or heat sink capability. We present the design and test data on ways to delay heat rise, such that inside surface temperature can be held below 50˚C for up to 5 minutes.

The second major problem for the firefighter is maintaining a survivable atmosphere inside the shelter and exposure during repositioning during a deployment. We propose possible solutions for these problems.

It is obvious that adding insulation to the existing shelter configuration will increase the weight and bulk of the unit. Lighter and less bulky alternative materials and methods of construction will be discussed to reduce this problem.

The talk is intended to inspire a fruitful discussion of the Fire Shelter program using test data and configuration suggestions to improve upon the current Fire Shelter design.

Keywords: Fire Shelter, Burnover survivability, breathable air, thermal burns

Bio: Vincent H. Homer, PE, CSP
My experience includes 40 years of fire related work in industry and government as a safety, fire protection and explosion mitigation engineer as well as a design engineer for an aerial fire fighting company. My most recent project was a fire fighting system to protect personnel in armored vehicle post IED fires. I have also been a wildland fire fighter as well as a volunteer fire fighter in both rural and industrial settings. My education includes a Associate degree in Mechanical

Technology, BS in Aerospace Engineering and an MS in Engineering Management. I hold a PE (Mechanical) in three states and am a Certified Safety Professional.

105. Special Session Seven: Wildland Firefighter Health and Safety at MTDC

Presenter: Joseph Domitrovich, PhD, Exercise Physiologist, Missoula Technology and Development Center
Tony Petrilli, Fire Equipment Specialist, Forest Service, Missoula Technology and Development Center
Joseph Sol, MS Exercise Physiology, Exercise Physiology Data Manager, Missoula Technology and Development Center

The Missoula Technology and Development Center (MTDC) have been engaged in the advancement of firefighter Health and Safety in the 1960's. MTDC has had a Memorandum of Understanding (MOU) with the University of Montana since 1963 and just established a MOU with NIOSH further advance our ability to help wildland firefighters. The work undertaken by MTDC has revolved around physiology and health. The projects include physiological job demands, heat related issues, acute and chronic health effects (rhabdomyolysis and compartment syndrome), smoke exposure, fitness requirements, physical training basic principles, and nutritional/hydration requirements. This special session will give an overview of the projects at MTDC and how they are all interconnected to improve wildland firefighter safety and health.

BIOS: Joe Domitrovich is an exercise physiologist at MTDC and a Pulaski motor when he can get away from his computer. However, he is slowly moving up into telling others where to dig. He completed his Ph.D. at the University of Montana, Missoula in Interdisciplinary Studies with an emphasis in exercise physiology.

Tony Petrilli is an equipment specialist for the Fire and Aviation Program at the USDA Forest Service's Missoula Technology and Development Center (MTDC). He holds a bachelor's degree in education from Western Montana College. Tony began working for the Forest Service in 1982 as a firefighter for the Lewis and Clark and the Beaverhead National Forests. He became a smokejumper in Missoula for the Northern Region in 1989. In 1992 he began working wintertime details at MTDC; he then joined the Center full time in 2000. He has been the fire shelter and firefighter clothing project leader since 2005. Tony maintains fire qualifications as a Division/Group Supervisor and Incident Commander Type III and has served on more than 25 fire entrapment safety review or investigation teams as a PPE specialist.

Joe Sol attended the University of Montana in Missoula, Montana, with a focus on exercise performance in adverse environmental conditions (heat/altitude). While attending school, employed by the US Forest Service as a wildland firefighter. Passionate about improving health and safety of wildland firefighters using practical application of research from both the laboratory setting as well as in the field.

MITIGATION

106. Too Late When The Wildfire Is At The Mines Gate

Presenter(s): Greg Bartlett, Brandon University, Rural Development Institute

In 2012, the Canadian Mining Industry contributed $52.6 billion to Canada's Gross Domestic Product (GDP). In that same year wildfire suppression costs reached almost 1 billion dollars. The risk of wildfires could impact the Canadian GDP and the communities that rely on the resource extraction industry.
Most raw mineral extraction takes place in rural and remote areas of Canada. In recent years the natural hazard of wildfire has come into conflict with the technical operations of mining. The interaction has become known as NATECH (Natural Hazard Triggering a Technological Disaster).

This presentation will give examples of global research into NATECH, while highlighting International & Canadian experiences in dealing with such conflict. The presentation will provide a deeper understanding on how comprehensive emergency management can assist rural and remote industries by using well established urban interface mitigation techniques that can reduce the impacts of NATECH on rural communities and land-use stakeholders.

Keywords: Natech, Mining, Community, Industry, Rural, Remote, Stakeholders, Mitigation, Industrial

Bio: Greg started pursuing his passion for Fire & Life Safety in 1998 when he joined the Canadian Forces, C.F.B. Petawawa, Base Fire Service. Since then Greg has held positions with Urban, Suburban and Rural fire services across Canada, always tackling conflicts with in the rural urban fringe. He then relocated to Western Canada in 2006, to become the Provincial Wildfire Prevention Officer with Saskatchewan Environment. Greg is now attending, Brandon University

in Brandon, Manitoba to complete his Science Degree in Applied Disaster & Emergency Studies, where he also is a collaborating, Student Researcher with the Rural Development Institute.

107. We all play a part- Bushfire Ready Neighbourhoods

Presenter(s): Peter Middleton, Community Development Coordinator, Tasmania Fire Service. Member of the International Association for Public Participation.

Additional Author(s):
Mai Frandsen, Dr- Reseacher, University of Tasmania

From pilot to program, the Tasmania Fire Service community development approach - the Bushfire Ready Neighbourhoods program.

In 2009 the Tasmania Fire Service embarked on a community development pilot program with the aim of trialling a community development approach to bushfire preparedness in a number of targeted communities that have a higher level of bushfire risk.

Critical to the approach was to build a strong evidence base by collaborating with the University of Tasmania, Australian Fire and Emergency Services Council (AFAC) and the Bushfire Cooperative Research Centre. This included the publication of a PhD thesis by Dr Mai Frandsen in 2012 titled: 'Promoting community bushfire preparedness: Bridging the theory – practice divide'. This collaborative research approach is leading the nation in informing best practice in community bushfire preparedness and has created a sound evidence base in Australia.

Since undertaking this pilot program Tasmania Fire Service has embarked on the implementation of a strategic community development program - Bushfire Ready Neighbourhoods including the employment of dedicated Community Development Officers across Tasmania. This has a long-term goal of embedding community development and engagement in the organisation's culture and the way we work with communities to share the responsibility for bushfire.

Peter will share the key learnings from this research. He will discuss key themes, what has worked, what has not and practical ideas that people working and volunteering at all levels in community bushfire preparedness can take from the research.
Key topics Peter will discuss include:

- 'One size does not fit all' community development approach;
- Case studies from Tasmania;
- Research and human behaviour analysis;
- Best practice community engagement;
- Evaluation techniques;
- Tools, techniques and approaches to building resilience.

National Winner of the 2014 Resilient Australia Award- the award recognises excellence and innovation in disaster resilience.

Keywords: shared responsibility; capacity building; community development; resilience; prevention; preparedness; organisational change; community led approach; engagement; research; evidence base.

Bio: Peter Middleton is the Community Development Coordinator at Tasmania Fire Service in Hobart, Tasmania, Australia.
Peter's role develops community capacity to prevent, prepare for and respond to bushfires and fires in the home. Peter coordinates the Bushfire Ready Neighbourhoods program which aims to increase shared responsibility and has a vision that 'we all play a part- individuals, fire agencies and communities'.

A member of the International Association of Public Participation. Peter has hands on firefighting experience as a Volunteer and Remote Area Firefighter in Australia for 15 years.

Peter has a passion for evidence based community development in emergency management which is demonstrated in the success of the program.

108. Impact of federal fuels treatments on community firesheds in the Deschutes National Forest

Presenter(s): Cody Evers, MS, MCRP, PhD Student, Portland State University

Additional Author(s):
Max Nielsen-Pincus, PhD, Assistant Professor, Portland State University
Alan Ager, PhD, Operations Analyst, USFS

Wildfires that spread from federal land to the urban interface are a primary cause of human and financial losses and escalating federal fire suppression budget. These fires are frequently transmitted across landscapes fragmented by ownership, development, fuels, management, and ecological conditions. Firesheds represent a conceptually simple way of capturing the complexity of these interactions within a single spatial area. Firesheds are built from values prioritized by communities - whether those are economic, social, cultural, visual or ecological - and expanded to include lands surrounding the community that can transmit wildfire hazard to those values. Mapping firesheds is a relatively new technique that can be accomplished using geospatial simulations - maps are built by tracing the extent of wildfire ignitions that are likely to burn into areas of value. Strategic fuel reduction simulations can be used to estimate the reduction of wildfire risk to community values, and to stimulate discussion about tradeoffs among community values. This information can used to revise or evaluate Community Wildfire Protection Plans (CWPPs) as well as to coordinate risk management activities both within and outside of the wildland urban interface, including surrounding public lands. To illustrate, we generated fireshed boundaries for the values at risk identified by 7 CWPPs in Deschutes County, Oregon, and assess the sensitivity of those fireshed boundaries to potential fuels treatments on nearby public land. Random wildfires were simulated on both treated and untreated landscapes, and burn conditions were developed from historical wildfires in the region. In the treatment scenario, twenty percent of the study area is mechanically thinned, prioritized on wildfire hazard and fire regime group. We find that fuel treatment on federal lands is especially important for some communities, but for others, has little influence on that community's fireshed boundary. We discuss implications of these finding for the design and revision of CWPPs and the coordination of wildfire risk management activities in the region.

Keywords: community wildfire protection plans, fireshed, wildfire simulation, wildfire risk, forest fuel treatments

Bio: Cody Evers is a PhD student and IGERT fellow at Portland State University School of the Environment. His research focuses on ecosystem services, urbanization, and wildfire risk management. He has been involved in wildfire simulation and wildfire risk assessment in the Pacific Northwest for over 5 years as part of numerous grants funded under NSF, USDA, and JFS.

TRAGEDY, DEATH AND RECOVERY

109. Wildland Fire Fighter Deaths in the United States: A Comparison of Existing Surveillance Systems

Presenter(s): Corey Butler, MS, Occupational Safety and Health Specialist, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health

Additional Author(s):
Joe Domitrovich, PhD, United States Forest Service, Missoula Technology and Development Center, Missoula, MT

Background: Wildland fire fighting is a high-risk occupation requiring considerable physical and psychological demands. Multiple agencies publish annual fatality data and/or summary statistics for wildland fire fighters (WFFs); however, the number and types of deaths reported varies. These differences create challenges to accurately characterize these fatal events. There are at least five different surveillance systems that capture deaths each with varying case definitions and case inclusion/exclusion criteria. Four of these are population systems and one is a case-based system. Methods We examined the data within each of the five surveillance systems to better understand the types of WFF data collected, to assess each system's utility in characterizing wildland fire fighters fatalities, and to determine each system's potential to inform prevention strategies. To describe similarities and differences in how data were recorded and characterized, we also matched the wildland fire deaths for three of the population based systems* and compared individual fatalities across systems. Results: Between 2001 and 2012, 247 unique deaths were captured among the

systems; 73% of these were captured in all three systems. The most common causes of death in all systems were traumatic injuries associated with aviation, vehicles and medical events (i.e., heart attacks), and entrapments/burnovers. Our data show that, although the three systems often report similar annual summary statistics, the actual events captured in each system vary by roughly 20% each year, depending on the types of events that the system is designed to track. Conclusions: The overarching and central goal of each system was to collect accurate and timely information to improve WFF safety and health. Each system is unique and has varying inclusion and exclusion criteria for capturing and tracking different subsets of WFF tasks/duties. Use of a common case definition and better descriptions/interpretations of the data and the results would help to more accurately characterize WFF traumatic injuries, lessen the likelihood for misinterpretation of WFF fatality data, and assist with defining the true occupational injury burden within this high-risk population.

Keywords: surveillance; fatalities; wildland fire fighter

Bio: Lieutenant Corey Butler is an Occupational Safety and Health Specialist at the NIOSH Western States Office (WSO) in Denver, CO. LT Butler began working at the NIOSH WSO in 2010. She has worked on a variety of NIOSH projects, including State-Based Surveillance, Health Hazard Evaluations (HHEs), Fire Fighter Fatality Investigations and Prevention Program (FFFIPP) investigations, and the Fatality Assessment and Control Evaluation Program (FACE). LT Butler is also Co-Program Coordinator of the NORA Public Safety Sector. Prior to coming to NIOSH, LT Butler was a Public Health Prevention Service (PHPS) Fellow with the Centers for Disease Control and Prevention. As a PHPS Fellow, she worked in Atlanta, GA, at NIOSH in the Office of the Director and at the Office of Public Health Preparedness and Response, Division of Strategic National Stockpile (OPHPR/DSNS); she also started the Colorado Department of Public Health and Environment's Occupational Health and Safety Surveillance Program. Corey received a Bachelor of Science degree in Occupational Safety and Health from Montana Tech in 2002, and a Master of Science in Health Promotion from the University of Montana in 2004. During college, LT Butler spent her summers fighting wildland fires with the United States Forest Service.

110. Common Denominators on Tragedy Fires - Updated For a New Fire Enviornment

Presenter(s): Matthew Holmstrom, Superintendent L&C IHC

In 1976 Carl Wilson put forth his 'Common Denominators on Tragedy or Near Miss Fires,' and since then they have become standard training tools in both classroom and field. In 2006 Dick Magnan updated the originals, adding an additional four based on recent statistics. In the wake of recent tragedies, this tool should again be updated, reflecting our knowledge of human behavior. This paper attempts to identify and list some of the human factor considerations of historical tragic and near miss fires. Based on individual readings, accident reports and lessons learned, the article compiles large data into a more manageable, teachable format to share the Human Factors Common to Tragedy Fires with the Fire Service.

Keywords: Lessons Learned, Common Denominators, Human Factors

Bio: Currently the Superintendent of the Lewis and Clark Hotshots, Matt Holmstrom has been involved in fire since 1996, starting with the USFS immediately following high school. Though originally planning to use fire with the USFS as a summer job to pay for advanced degrees in History to go on and teach, that plan was derailed by the excitement, passion and commitment common to the fire service. As the Superintendent on L&C Matt has made training, especially in human factors, a key component to producing quality leaders and hopes to fight fire as long as the knees hold out

111. Embracing Recovery: Establishing a Chaplaincy Service for the Wildland Fire Community

Presenter(s): Matthew Carroll

Resilience, as it is applied in an organizational safety context, is defined by three primary components, anticipation, adaptation and recovery. Much of our focus is on the first two, theoretically because it is better to avoid than recover from some tragedy, but in order to wholly embrace the resilience concept we must allocate time and resources to building the capacity to recover.

The military chaplaincy service is an exemplary model of this. At a basic level, military chaplains are there to support "the free exercise of religion for men and women of all faiths," but serve to support pastoral care (spiritual and

emotional counseling) needs as well. Although the military chaplaincy service is the most well known, structure fire, police departments and professional athletic teams also have them. A chaplaincy service aligns well with the concept of resilience in that it treats wildland firefighters as whole people while they are engaged in physically and emotionally taxing duty. Without such a service we are expecting firefighters to set aside part of their lives for the time they are committed to the incident, to just be firefighters and not whole people; this is fragile.

Typically when tragedy does strike, religious figures are brought in to aid as needed in the process of recovery. These individuals lack context and understanding of the daily life of wildland firefighters and have little to no previous connection with the people they are brought into help. An established chaplain would be in a better position to understand the unique character of the wildland fire community and may have already established a relationship with those affected. Building this pool of capacity for recovery is tangible resilience. This session will focus on introducing the idea of a wildland fire chaplainry service, determining its feasibility, level of acceptance and potential next steps.

Keywords: Chaplaincy Programm, Resilience, Recovery

Bio: Matt Carroll is currently a Smokejumper/Spotter at the McCall Smokejumper base and has been a wildland firefighter since 2000. He has been detailed in to the Human Factors Specialist position at the US Forest Service Office of Learning (OOL) since January of 2014. Matt's work with the OOL began with the creation of the Margin video to bring the concept to the field. He has also been working on accident/incident reporting systems, risk assessment and management, Individual and organizational learning and resilience.

FIREFIGHTER SAFETY

112. Assessing Firefighter Safety Zone Characteristics

Presenter(s): Philip Dennison, University of Utah

Additional Author(s):
Greg Fryer, University of Utah
Michael Campbell, University of Utah

Firefighter safety zones create a buffer between firefighters and dangerous fuels, reducing heat exposure to safe levels and preventing firefighter injury or fatality. Current guidelines for creating a safe separation distance (SSD) from fuels rely on a multiple of four times flame height plus sufficient area for the number of personnel and for equipment. Future guidelines for SSD may use vegetation height rather than flame height and include a multiplier based on wind and slope conditions. In either case, these guidelines represent ideal safety zones and actual safety zones designations may substantially deviate from guidelines due to limits of practical implementation. This talk will reveal preliminary results from an analysis of 12 safety zones used by a hotshot firefighter crew during the 2014 fire season. Recent progress on a spatial model for safety zone mapping will be reviewed. Safety zone characteristics for the 12 safety zones described in 2014 will be examined. Plans for collecting additional safety zone survey data for the 2015 fire season and beyond will be discussed.

Keywords: safety zones, LCES, safe separation distance

Bio: Dr. Philip Dennison is a Professor of Geography at the University of Utah. He is the Director of the Utah Remote Sensing Applications Lab, and is an author on over 50 publications addressing wildfire and remote sensing topics.

113. Lidar mapping of firefighter safety zones: A comparison of flame height- and vegetation height-based guidelines

Presenter(s): Michael Campbell, PhD Student, University of Utah Department of Geography

Additional Author(s):
Dr. Philip Dennison, Professor, University of Utah Department of Geography
Bret Butler, Research Mechanical Engineer, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory, US Forest Service

The ability of wildland firefighters to efficiently determine the suitability of safety zones is essential for preventing

injuries and fatalities in wildfire events. At present, this assessment is largely performed by firefighters in the field. For more than a decade, safety zones were defined by a safe separation distance (SSD) equal to or greater than four times expected flame height. New guidelines suggest that this SSD should instead be computed based on the height of the surrounding vegetation, the slope of the terrain, and the wind speed. Though wind speeds are variable, vegetation heights and slopes remain fairly stable, enabling the evaluation of safety zone suitability prior to a wildfire event. The objective of this study was to compare the size and number of safety zones mapped with lidar data using alternative flame height- and vegetation height-based SSD guidelines. A study area covering approximately 450km2 in the Boulder Creek watershed, outside of Boulder, Colorado was examined. Results from the analysis suggest that the new vegetation height-based guidelines allow for fewer safety zones that are smaller in size. The models developed in this study can be adapted for use in a variety of vegetation types, offering a tool for identification and inventorying of potential wildfire safety zones.

Keywords: Lidar, Remote Sensing, GIS, Firefighter Safety Zones, WIldfire, Boulder, Colorado

Bio: Michael Campbell is a first-year PhD student in the Geography Department at the University of Utah. His PhD research focuses on the use of GIS and remote sensing in assessing and modeling firefighter safety. Prior to beginning his PhD, Michael worked for two years at the USFS Remote Sensing Applications Center as a Vegetation Mapping Specialist. He received his M.S. in Natural Resources from the University of New Hampshire, where his research revolved around remote sensing approaches to detecting timber harvesting practices in northeastern Oregon. In his free time, Michael enjoys skiing, hiking, biking, playing soccer and hockey.

114. Evaluation of a Safety Zone Digital Calculator

Presenter(s): Joaquin Ramirez, Technosylva

Additional Author(s):
Bret Butler, Missoula Fire Sciences Laboratory. USFS
Dan Jimenez, Missoula Fire Sciences Laboratory, USFS

Wildland firefighting by its nature is inherently dangerous. One of the critical decisions made by fire fighters on any wildland fires is the identification of suitable safety zones: areas where firefighters can safely wait for the fire to burn around them. The United States Forest Service defines a safety zone as "a preplanned area of sufficient size and suitable location that is expected to protect fire personnel from known hazards without using fire shelters". It is the intent that safety zones should be available and accessible in the event that fire behavior or intensity increases suddenly making current suppression tactics unsafe. We propose that the primary variable of interest be safety zone radius or its operational equivalent safe separation distance (SSD). In this presentation we describe a simple digital app that computes the minimum size of a safety zone needed to prevent burn injury as a function of vegetation type, terrain slope and wind. We present results from the app for a range of vegetation, terrain and wind conditions and compare the results to past fire incidents.

Keywords: Firefighter Safety, safety zone, fire behavior

Bio: Joaquin Ramirez , PhD in Forestry and Geomatics from the University of Leon. Co-Director of the first European MsC program on Wildfires (www.masterfuegoforestal.es) where he teaches "Geotechnologies on Wildfires". His applied research is focused on wildfire modelling and geo-tools. He is the principal of Technosylva, (San Diego), where he develops tools for operational support, as Wildfire Analyst, first wildfire simulator oriented to support real time operations, and fiResponse, a complete wildfire management system used in European agencies since 1997 (www.wildfireanalyst.com www.firesponse.com).
He has also leaded Risk Assessments of different Spanish regions and in the US, as the Wildfire Risk Assessment for MC Camp Pendleton.

CLIMATE/WEATHER/FIRE EXTREMES

115. Adding to fire fighter safety through modeling of thunderstorm-induced windshifts: A case study with the 30 June 2013 Yarnell Hill Fire

Presenter(s): Gary L. Achtemeier, PhD, Retired

Additional Author(s): Scott L. Goodrick, PhD, Project Leader, USDA Forest Service Center for Fire Disturbance Science

One of the most serious threats to the safety of fire crews is wind shifts caused by thunderstorm downdrafts. Slow-spreading low-intensity flanking fires can be transformed, in the matter of a few seconds, into a raging high-intensity head fire destroying anything and killing anyone in its path. Unless thunderstorm outflows are deep enough or close enough to radars to be observed, they can travel for great distances undetected. Some outflows can travel 50-100 miles from source regions to strike fire sites without any signs of changing weather.

We describe a class of thunderstorm wind models that allow Incident Commanders and others to see the progress of nearby outflows, assess the risk of changes in wind speed and direction, and take action to move fire crews to safety up to 30-60 minutes before wind shifts arrive at a fire site. The models link real-time operational radar precipitation data with ambient temperature and relative humidity to map locations and fields of outflow wind velocities they evolve relative to local terrain during the course of the day.

We demonstrate the potential of thunderstorm wind models for fire fighter safety through a "proof-of-concept" study of weather conditions that contributed to the deaths of 19 fire fighters at Yarnell Hill on 30 June 2013. The model was set up for the terrain of Arizona surrounding the Yarnell region with a resolution of 900 m. Radar data for 30 June 2013 were supplied by the National Weather Service radar located south of Flagstaff, AZ. Temperature and surface winds were supplied from Peeples Vally (1209-1509 LST) and from Phoenix from 1509-1709 LST.

At 1500 LST, gust flows breeched a gap in the mountain range about 30 km (18 mi) north of Yarnell. This gust flow surged south to reach the northern perimeter of the fire by 1616 LST (arrival reported at 1618 LST). Meanwhile outflows breeched a second gap in the mountain range 12 km (7 mi) east-northeast of Yarnell, merged with the southward-moving outflow, and arrived at the fire from the northeast. The outflow passed the southern perimeter of the fire between 1630-1645 LST (arrival reported at 1630 LST).

The results show the potential for thunderstorm outflow wind models to inform Incident Commanders of dangers pending from sudden thunderstorm-induced wind shifts, giving them time to assess the risk of changes in weather, and take action to move fire crews to safety before wind shifts arrive at a fire site.

Keywords: wind shifts, fire behavior, thunderstorm out flows, fire fighter safety

Bio: Gary L. Achtemeier now retired was formerly a meteorological scientist at the USDA Forest Service Center for Fire Disturbance Science located at Athens, Georgia, with interests in smoke/superfog -induced highway accidents, fire modeling, and thunderstorm-related hazards to fire management.

116. Prototype Fire Weather Impact Based Performance Metric

Presenter(s): Robyn Heffernan

It is the interaction of weather with an ignition or ongoing fire, combined with a community's vulnerability, which produces an impact. The intent of an impact based fire weather verification methodology is to develop a quantitative measure of customer satisfaction using non-meteorological parameters and fire based impacts. A prototype impact based performance fire weather metric with a couple years of data for sample locations was developed to illustrate how to potentially meet this intent.

The NWS produces a next day National Fire Danger Rating System (NFDRS) forecast. These forecasts aid Land Managers in making fire management decisions on a daily basis. All fire management decisions in a Fire Danger Rating Area (an area of land management responsibility) are based on NFDRS outputs. Staffing Level and Adjective Rating are commonly used by fire managers to make fire management decisions including how land management resources are to be allocated. Staffing Level is used for internal Land Management Agency resource allocation, while Adjective Rating is used to communicate fire risk to the public and limit public impacts on fire risk. Staffing Level and Adjective Rating are computed using a combination of NFDRS outputs.

Categories of fire management decisions (i.e. Staffing Level and Adjective Rating) for both forecasted and actual weather variables are compared to see if forecast error would have resulted in a different decision for the customer. The

numbers of "Categories of Departure" between forecast and observed decision categories provide the "Error Value." The lower the "Error Value" the more successful the fire weather forecast impact on fire operations. Depending on resource needs that are associated with different levels of fire management decisions, a monetary estimation can be assigned to the Error Value. This enables the verification metric to quantify the value of fire weather forecast based on customer impacts. There are plans for this fire weather prototype to be run in a real-time analysis during the 2015 summer fire season.

Keywords: metric, verification, fire weather

Bio: Robyn Heffernan is the National Weather Service Fire Weather Science and Dissemination Meteorologist located in Boise, ID. Since early 2011, Ms. Heffernan has been responsible for leading several technological and science based efforts for the NWS fire weather program, as well as integrating these efforts into fire weather operations. Previously, Ms. Heffernan had joined the Predictive Services program as the Assistant National Fire Weather Program Manager for the Bureau of Land Management. Ms. Heffernan is currently the chair of the National Wildfire Coordination Group, Fire Environment Committee. Ms. Heffernan has a B.S. degree in Geography from Arizona State University.

117. Understanding effects of heat dosage on soils from slash pile burning in a Piñon-Juniper system (Pinus edulis-Juniperous monosperma)

Presenter(s): Elyssa Duran

Additional Author(s):
Dr. Sara Brown, Assistant Professor of Forestry, NMHU

Historically the Pinon-Juniper (Pinus edulis-Juniperus monosperma) savannas of the Lincoln National Forest near Ruidoso, New Mexico were much less dense, with large open patches of native grasslands with interspersed shrubs. Encroachment of these species is not well understood, but thought to be related to fire suppression, grazing, climatic factors, and other management activities. One method used to restore Pinon-Juniper savannas is thinning the trees, and then using heavy machinery such as a bulldozer to create piles of slash that are later burned. The goal of this study is two-fold: 1) to evaluate the heat dosage (intensity and duration) during burning across a spatial gradient from the center of the pile to the edge, as well as at 5cm below ground, and 2) to relate heat dosage in the slash piles to post-fire effects on the soil. Ten large slash piles were selected with control sites of a similar size immediately adjacent. Fuel loads were calculated for each pile and thermocouples were placed on the soil surface in the center of the pile, between the center and the edge of the pile, at the edge of the pile, and at 5cm below ground between the center and edge. We examined soil moisture, soil infiltration, soil pH, soil carbon content, soil texture, and soil stability at the slash piles and control sites. These measurements along with the thermocouple data will help us understand fire effects on soils. Preliminary results suggest that there is a heat dosage gradient from the center of the pile to the edge, and that the fire effects on soils are correlated to the heat dosage. These findings will help inform resource decision for land managers grappling with restoration of the woodland-savannas.

Keywords: Prescribed Fire, Pile Burn, Soil Effects, Burn Temperature

Bio: Elyssa Duran is a student at New Mexico Highlands University in Las Vegas, NM. This New Mexico native is a Candidate for a Master's of Natural Sciences. Elyssa has been involved previously with other wildland fire research examining soil nutrient levels on the 2011 Las Conchas Fire in her undergraduate work. She is now dedicated to researching the effects of pile burns, specifically on soils, as her Master's Thesis work.
Mitigation

118. Cost-effective fuel treatment planning

Presenter(s): Jason Kreitler, PhD, Research Geographer, U.S. Geological Survey

Additional Author(s):
Matt Thompson, PhD, Research Forester, U.S. Forest Service
Nicole Vaillant, PhD, Fire Ecologist, U.S. Forest Service

The cost of fighting large wildland fires in the western United States has grown dramatically over the past decade. This

trend will likely continue with growth of the WUI into fire prone ecosystems, dangerous fuel conditions from decades of fire suppression, and a potentially increasing effect from prolonged drought and climate change. Fuel treatments are often considered the primary pre-fire mechanism to reduce the exposure of values at risk to wildland fire, and a growing suite of fire models and tools are employed to prioritize where treatments could mitigate wildland fire damages. Assessments using the likelihood and consequence of fire are critical because funds are insufficient to reduce risk on all lands needing treatment, therefore prioritization is required to maximize the effectiveness of fuel treatment budgets. Cost-effectiveness, doing the most good per dollar, would seem to be an important fuel treatment metric, yet studies or plans that prioritize fuel treatments using costs or cost-effectiveness measures are absent from the literature. Therefore, to explore the effect of using costs in fuel treatment planning we test four prioritization algorithms designed to reduce risk in a case study examining fuel treatments on the Sisters Ranger District of central Oregon. For benefits we model sediment retention and standing biomass, and measure the effectiveness of each algorithm by comparing the differences among treatment and no treat alternative scenarios. Our objective is to maximize the averted loss of net benefits subject to a representative fuel treatment budget. We model costs across the study landscape using the My Fuel Treatment Planner software, tree list data, local mill prices, and GIS-measured site characteristics. We use fire simulations to generate burn probabilities, and estimate fire intensity as conditional flame length at each pixel. Two prioritization algorithms target treatments based on cost-effectiveness and show improvements over those that use only benefits. Variations across the heterogeneous surfaces of costs and benefits create opportunities for fuel treatments to maximize the expected averted loss of benefits. By targeting these opportunities we demonstrate how incorporating costs in fuel treatment prioritization can improve the outcome of fuel treatment planning.

Keywords: cost modeling, fuel treatment planning, ecosystem services, cost-effectiveness

Bio: Jason Kreitler is a research geographer for the USGS working in the fields of conservation and natural resource management, including wildland fire. His research uses multiple disciplines and quantitative methods to understand the pattern and process of climate and land use change in socio-ecological systems.

119. Left out from wildfires mitigation: Does university's population think different?

Presenter(s): Thomas, Wuerzer, Ph.D., Assistant Professor, Boise State University

This research presents a novel perspective on college students and their risk perception in a fire prone US State; Idaho. Idaho was "top #1" by acreage in 2012 with approximate 15% of all US burned lands; in 2013 "top #2". Past studies have conducted surveys on residents in high wildfire risk communities to learn what factors make homeowners more likely to engage in mitigation activities and therefore increase communities' resiliency. This research emphasis is on a population that deals with the threat of fire but is likely less invested through property ownership and other investment of risk; yet, equally threatened in quality of life.

Are college students the left-out population in the 'planning for wildfires' and its communication process?

Main hypothesis is that a college population will have a different perception and awareness (and therefore mitigation actions) than i.e. residents invested in the wild land urban interface (WUI). Dominant research methodologies in past studies are identified as surveys, focus groups, or interviews focusing on homeowners in fire prone areas that have witnessed wildfire or are exposed to increasing fire risk. Yet again, research on population that has no property ownership, investments at stake, and therefore no direct monetary values associated (but potentially non-monetary), is found little to none in these studies.

The university population based study and its findings offers a contrast to current literature related to these traditional residents surveys/interviews. The study's survey and interactive spatial assessment of risk perception with allocation of perceived hazards zones promotes understanding of where risk is apparent for participants. Results are used to inform agencies such as campus emergency management, regional wild fire mitigation efforts, and to enhance public communication. Lessons learned include the challenges of a comprehensive inclusion process when mitigating for hazards and building resiliency in a region with development pressures.

Keywords: Wildfire, college students, risk perception, wildland urban interface

Bio: Dr. Thomas Wuerzer is Assistant Professor in Boise State University's Department of Community and Regional Planning. His work and research are bridged by an in-depth background in Geographic Information Systems (GIS). He is

actively researching regional planning issues of wildfires within the Wildland Urban Interface with focus on wildfire and related hazards' impacts on natural and built environment, wildlife and human habitat.

120. Boulder County Wildfire Partners - Home Ignition Zone, Education, Certificates, Case Studies and iPads

Presenter(s): Ryan Ludlow, Forestry Education and Outreach Coordinator, Boulder County Colorado

Wildfire Partners is a new and innovative way to help homeowners prepare for wildfires. We provide a comprehensive, 2-4 hour assessment of the home ignition zone; a customized report detailing actions homeowners should take; a rebate for mitigation work; and a follow-up certification to ensure that the homeowner is as prepared as possible. In 2014, we easily enrolled our target of 500 homes and conducted 450 assessments.

Meetings between Boulder County staff and some of the nation's leading wildfire mitigation scientists—Jack Cohen and Steve Quarels—helped build our program design. We focus on the need to create effective d-space, retrofit homes and maintain the efforts over-time. The latest social science highlights the importance of education and the need to explain the real hazard homeowners' face. This is why we require each homeowner to actively participate in their home assessment.

Our program is using an innovative home assessment tool, an iPad app, which can be easily replicated in other communities. The app is powerful and allows us to capture photos and annotate them directly in app. Wildfire Partners is rich in data. All data we collect via the iPads is tracked in salesforce, a powerful database. Data can be analyzed by home, fire district, and mitigation measure. We also track the total hard dollars and hours of labor each homeowner contributes. At this presentation we will share our data, case studies and stories from homeowners who are benefiting from the program.

After homeowners complete all required mitigation measures we re-visit their property. If they pass their inspection we issue a Wildfire Partner Certificate. Allstate Insurance has announced their support for the initiative by being the first insurance company to accept our certificate.

The program has proven very popular with participants. In a recent survey, 91% of respondents said they are very likely or likely to refer a friend or neighbor to the program.

Our presentation will provide an overview of our program design, our innovative approach, the iPad assessment tool and why we believe Wildfire Partners is designed for success.
To learn more about Wildfire Partners visit: http://www.wildfirepartners.org/

Keywords: Wildfire Mitigation; Home Ignition Zone; Defensible Space; Home Retrofits; Education and Outreach; Case Studies; Certificates; Technology; iPad Assessment Tools; Mitigating Fire Risk; Understanding Risk; Wildland Urban Interface; Building Resilient Commun

Bio: Ryan Ludlow coordinates the Forest Health Outreach Program for Boulder County in Colorado. Ryan passionately promotes the need for proactive wildfire mitigation and understands the importance of designing effective educational programs. In 2010, the Fourmile Fire ignited in the foothills of Boulder County destroying 169 homes. This fire motivated Ryan and Boulder County to do more to help residents prepare for future wildfires. Over the past few years he has built a wide-reaching educational network that is working. Homeowners are taking personal responsibility and when you visit the foothills of Boulder County you can see the impact.

FUELS MANAGEMENT

121. Description of Firebrand Generation in a Pine Stand Fire

Presenter(s): Albert Simeoni, BRE Centre for Fire Safety Engineering, University of Edinburgh, UK

Additional Author(s):
M. El Houssami - BRE Centre for Fire Safety Engineering, University of Edinburgh, UK
E. Mueller - BRE Centre for Fire Safety Engineering, University of Edinburgh, UK
A. Filkov - National Research Tomsk State University, Russia
J.C. Thomas - BRE Centre for Fire Safety Engineering, University of Edinburgh, UK
N. Skowronski - USDA Forest Service, Northern Research Station, USA
M. Gallagher - USDA Forest Service, Northern Research Station, USA

K. Clark - USDA Forest Service, Northern Research Station, USA
R. Kremens - Rochester Institute of Technology, USA
A study on the generation of firebrands was carried out during a high intensity prescribed fire in the New Jersey Pine Barrens in March 2013. New methodologies were tested to obtain insight on the firebrand activity, and to quantify firebrand showers close to a fire front. Firebrands were collected from different locations in the forest during the fire and were analyzed for mass, size distribution and number density. Most firebrands were bark slices with substantial amounts of pine and shrub twigs. Bark consumption was studied by measuring the circumference variation at several heights on each of three different pine trees. The variation was in the same order of magnitude as the bark thickness determined in the firebrand collection section (1 to 5 x10−3 m). Shrub branches were compared before and after the burn with subgroups for 1h fuels then were compared to the collected shrub originated firebrands. Fire behavior, and fuel consumption were estimated to supplement the firebrand generation study: vegetation was characterized with field and remotely sensed data before the fire, canopy fuel consumption and shrub layer consumption were evaluated; meteorological conditions were monitored before and during the burn; fire spread and fire intensity were characterized in the burn plot. This work represent first exploration of various methodologies that will facilitate the collection of compatible data in a wide range of ecosystems and fire environments, aiding in the development of solutions to prevent structural ignition at the Wildland Urban Interface.

Keywords: Firebrand, Bark, Generation

Bio: Albert Simeoni is a professor at the University of Edinburgh, UK. He is also the director of the BRE Centre of Fire Safety Engineering. Previously, he was an associate professor at Worcester Polytechnic Institute, USA and assistant professor at the University of Corsica, France, where he got his PhD in Mechanical Engineering. He is working on the fundamental aspects driving fire behavior by conducting experimental, modeling and simulation studies, in which he focuses on the combustion, thermal transfer and fluid mechanics aspects.

122. Fuel Treatment Research and Technology Transfer – How to Better Support Practitioners' Needs

Presenter(s): Thomas Zimmerman. Ph.D. Senior Wildland Fire Consultant, Tom Zimmerman Consulting.

Additional Author(s):
Richard Lasko. Natural Resource Consultant. US Forest Service retired
Merrill Kaufmann. Emeritus Scientist, Rocky Mountain Research Station

Significant changes occurring in the wildland fire environment of the United States are generating uncharacteristic shifts in the complexity, behavior, extent, and effects of wildfires. Treatment of wildland fuels to mitigate the risk of severe wildland fire impacts to human communities and valuable natural and cultural resources, and maintain and improve the health and resiliency of forest and rangeland ecosystems is emerging as a keystone land management process. With fuel treatment activities receiving greater attention and scrutiny, it is imperative to find ways to improve overall fuel treatment program effectiveness. The foundation for successfully meeting this challenge is research that addresses pertinent issues and provides actionable information to support management practices. Although much work has been done on this subject, there is a need to provide better guidance to research and development to address high priority knowledge and technology needs. Many questions remain at the center of both management and policy. We conducted a one-year study, supported by the Joint Fire Science Program (JFSP), that surveyed a large number of individuals across the United States from areas including, but not limited to fire and fuels management, research, education, technology transfer, program management, decision-making, and program leadership. From these individuals we gathered fuel treatment research needs; explored the progress of the scientific community in meeting these information needs; examined technology transfer venues that link practitioners to scientific information; and assessed program reference materials, management tools, and other supporting information. From this information, we identified potential areas of future fuel treatment research and possible venues for improving technology transfer.

Keywords: fuel treatment, science, fire management, wildfire, fire risk, technology transfer

Bio: Thomas Zimmerman is senior wildland fire management consultant. He served for 35 years in wildland fire management with the Bureau of Land Management, National Park Service, and US Forest Service in various capacities at all organizational levels. He has worked in areas of fire ecology, fire suppression, prescribed fire, wildland fire use, fire behavior, smoke management, incident management, emergency response, technology transfer, training, national fire policy development and implementation, fire reviews and accident assessments, decision making, risk assessment, and

change management. He is a certified Senior Fire Ecologist and Senior Wildland Fire Manager by the Association of Fire Ecology.

123. Modeling Potential Fire Behavior Changes Due to Fuel Breaks in the Monterey Ranger District, Los Padres National Forest, California

Presenter(s): Stacy Drury, PhD, Senior Fire Ecologist, Sonoma Technology Inc.

The Monterey Ranger District (MRD) of the Los Padres National Forest and its partner, FireScape Monterey, are proposing to re-establish and maintain a set of fuel breaks around the Ventana Wilderness. The proposed fuel breaks are intended to 1) increase fire suppression efficiency, 2) reduce wildfire risk to life and property near the MRD and surrounding communities, 3) reduce wildfire suppression costs, and 4) reduce adverse fire suppression impacts. I used the fire behavior modeling tools in the Interagency Fuels Treatment Decision Support System (IFTDSS) to analyze whether the fuel breaks would increase wildland fire suppression efficiency and reduce wildfire risk to life and property. The project objectives were to a) identify if large fires would occur within the Ventana Wilderness and move into the surrounding wildland-urban interface (WUI), b) identify whether the fuel breaks are strategically located where they will be encountered by wildfire, and c) identify the potential for the fuel breaks to mitigate fire movement into the communities of Big Sur, Palo Colorado, and Cachugua.
I used a multi step process to bring historical fire occurrence, historical fire weather patterns, and fuel model assessments into a fire behavior modeling framework. I modeled potential fire behavior and fire growth across spatial landscapes with and without the proposed fuel breaks simulated in the landscape. Baseline conclusions support preparing and maintaining the fuel breaks. The modeling shows that fuel breaks are strategically placed in locations that have historically burned during wildfires and/or have provided opportunities for fire suppression activities, such as back burning. Alone, and in conjunction with fire suppression actions, the fuel breaks can lower flame lengths and mitigate fire movement, meeting the objectives of the MRD. The lowered flame lengths and decreased rates of spread can provide opportunities for firefighters to use alternative strategies for suppressing fire. Pre positioned fuel breaks can serve as anchor points for creating additional fuel breaks as needed or provide safe areas for igniting back burning operations.

Keywords: Fuels Treatment planning, Fuels Treatment evaluations, Fire Behavior Modeling

Bio: At STI, Stacy provides scientific oversight and technical guidance on fire and fuels research and software development. He conducts research on fuel loading, fire occurrence, fire behavior, fuel consumption, and fire effects. Much of Stacy's research is centered on modeling wildfire hazard and risk – in particular, how fuels treatments mitigate fire hazard and risk to natural resources and communities. He has assessed fuels treatment effectiveness using satellite imagery, modeled fuel loading changes due to fuels treatments, and modeled potential fire behavior and fire effects in the Wildland Urban Interface.

FIREFIGHTER SAFETY

124. Yarnell Hill Entrapment; Additional lessons that could be learned

Presenter(s): Rich McCrea, Wildland Fire Consultant, LarchFire LLC

Additional Author(s):
Al Studt, Lieutenant, Cape Canaveral Fire Rescue

On June 30, 2013 nineteen wildland firefighters from the Granite Mountain Hotshots lost their lives on the Yarnell Hill Fire. There are mapping techniques, technologies and protocols that could be used on future wildland fires that would enhance operations and be valuable during emergencies, when teams are in trouble. These include enhanced mapping techniques by use of the United States National Grid (USNG), the use of MAYDAY terminology & processes, and using web tools in combination with smart devices to quickly make interoperable maps or files for immediate use as the firefight is just beginning.
MAYDAY: In the United States, structural firefighters have for years used this term to designate serious trouble and personal danger. Departments all over the nation have protocols and have trained on how to react to MAYDAYs.
No such single word exists for wildland firefighters and there is no reason to create a new separate one. The strong recommendation is that forestry/wildland fire management adopt the standard term MAYDAY and train with it.

US National Grid USNG: U.S. National Grid (USNG) standard, FGDC-STD-011-2001, provides a nationally consistent

language of location that has been optimized for local applications. The USNG expands the utility of topographic, street, and other large-scale maps by adding several powerful features: It provides an standard grid reference system that is seamless across jurisdictional boundaries; it provides the foundation for a universal map index; it enables quick, user-friendly position referencing on appropriately gridded paper and digital maps, global positioning systems (GPS) receivers, smart phones, tablets and desk computers. USNG is easy to learn and use and is interoperable with multiple agencies including the US Military. There are many potential applications of USNG in wildland fire operations including tracking firefighting resources, planning and implementation of daily fire operations, and tracking fire behavior across the landscape. Finally, truncated USNG shall be used by teams calling MAYDAY. The recommendation for this is 100 meter square grids of just six digits. For the Yarnell 19 it would have been: 362 880.

Keywords: Yarnell Hill Incident, US National Grid

Bio: Rich works as a wildland fire management consultant and freelance writer. During his career, he worked 32 years with the Department of Interior in fire management and forestry. Outfitted with a degree in Forestry, he started his career as a seasonal employee with the Forest Service as a forestry technician and member of the Helena Hotshot Crew, then moved on to permanent positions with the Bureau of Indian Affairs as a Forester and Fire Management Officer. Rich has considerable experience working with incident management teams including over 23 years' experience as a qualified fire behavior analyst

125. Distilling and disseminating new scientific understanding of wildland fire phenomena and unfolding of large wildfires to prevent wildland firefighter entrapment

Presenter(s): Janice Coen, PhD, Project Scientist, NCAR

Large wildland fires are dynamic phenomena that may encounter a wide range of fuels, terrain, and environments often during one event and can produce extreme phenomena not observable in laboratory or prescribed fires such as blow-ups, 100-m long bursts of flame shooting ahead of the fire line, fire winds 10 times stronger than ambient wind speeds, deep pyrocumulus, and firestorms in which the fire-generated winds overwhelm ambient winds – all resulting from the interactions between a fire and its atmospheric environment, notably the production of fire winds. Despite uniform training curricula, rigorous command and control structures, and succinct principles like the 10 Standard Fire Orders and 18 Watch Out Situations, even seasoned firefighters may be tragically unprepared for complex and explosive fire behavior that can lead to burnovers.

Both observational and modeling research have unearthed dynamic fire phenomena and confluences of atmospheric, fuel, and topographic conditions that have likely contributed to numerous firefighter fatality incidents. Infrared imagery has revealed bursts of flame that shoot ahead of the fire line along the ground; such imagery and phenomena has recently reached S290 training curricula. Coupled weather-wildland fire models tie numerical weather prediction models to wildland fire behavior models to simulate the impact of a fire on the atmosphere and the subsequent feedback of these fire-induced winds on fire behavior, i.e. how the fire creates its own weather. We apply the CAWFE coupled weather-fire modeling system to past fatality incidents including the Esperanza Fire and Yarnell Hill Fire events to understand past wildfire events and distill knowledge for dissemination with the wildland firefighting and scientific community. We show how CAWFE, currently being implemented as a forecasting tool as it transitions from research to operational use, can be used to anticipate fire growth and changes in fire behavior, filling a gap where current tools are weakest, in plume-driven fires and those affected by changing weather conditions.

Keywords: fire behavior, weather modeling, coupled atmosphere-fire models

Bio: Dr. Janice Coen is a Project Scientist at the National Center for Atmospheric Research in Boulder, Colorado. She studies fire behavior and its interaction with weather using coupled weather-fire computer simulation models and by analyzing infrared imagery of wildfires and prescribed fires. She received a B.S. in Engineering Physics from Grove City College and an M.S. and Ph.D. from the Department of Geophysical Sciences at the University of Chicago. She has been a member of the Board of Directors of the International Association of Wildland Fire and is currently an Associate Editor for the International Journal of Wildland Fire.

126. Listening Up, Down, and Around: Sound Studies and Wildland Firefighter Situational Awareness

Presenter(s): John Widman, PhD Student and Teaching Assistant, UCLA Department of Ethnomusicology

When listening is discussed in training curriculum and articles concerning wildland firefighting in the United States, the primary focus is on building positive interpersonal communication skills and providing a basis for good communication. However, formal discussions on the application of listening to sounds in the wildland fire environment to achieve greater situational awareness are rare. According to the NWCG L-180 "Human Factors on the Fireline" instructor's course book, situational awareness is a product of "observations" and "communication". However, there is no suggestion that "observation" should include anything beyond visual information other than receiving observations communicated by another party. In the S-133 "Look Up, Look Down, Look Around" course, firefighters examine seven key environmental factors to risk management that are also in the Incident Response Pocket Guide. While firefighters are encouraged to handle fuels to help evaluate moisture and temperature, other environmental cues are assessed visually. This is a logical and effective approach, but including other senses might help us add depth to our current practices. One way to achieve this would be encouraging purposeful listening in the fire environment, both to respond to aural cues and as a way of involving other senses in information gathering.

Evaluating sounds to achieve greater situational awareness is already a part of recent studies on the role of sound in the Iraqi conflict. Researcher Martin Daughtry catalogs several ways soldiers use sounds from different kinds of weapons and situations to enhance knowledge of the battlefield. Conversely, Suzanne Cusick and Jonathan Pieslak survey how music has been used at high volumes to overwhelm the senses of opposing forces and detainees. While we are not "at war" with fire, examining these existing studies of how sound can be used both to enhance and confuse understanding might help us better comprehend how to evaluate our own sound environments as firefighters. By placing the work of Cusick, Daughtry, and Pieslak in dialogue with existing informal commentary on wildland fire soundscapes found in written and video accounts as well as my own experience, I intend to show how sound studies can augment our existing conceptions of situational awareness.

Bio: John Widman is a PhD student in UCLA's Ethnomusicology Department focusing on ways that music and culture interact. Spending eight seasons (2006-2013) as a wildland firefighter based in Alaska, he is interested in the relevance of contemporary studies in sound to the firefighter.

CLIMATE/WEATHER/ FIRE EXTREMES

127. Fire Extremes and the Triangle of Climate, Fuels and People (Part 1)

Presenter(s): Tamara U. Wall

Additional Author(s):
Timothy Brown, Director, Western Regional Climate Center, DRI

Over the past decade or so, statements by fire personnel claiming unusual fire behaviour beyond training or experience levels seem to be increasing. Concurrently, climate and weather extreme events have been increasing, fuel loads have notably increased due to both natural occurrence and management practices, an human populations have been expanding into the wildland and rural interfaces. All of these factors appear to be intersecting causing an increase in "extreme" fire events based on another fire triangle of climate, fuels and people. Sometimes fire personnel are surprised at how large a fire becomes. In some cases, the extreme event is truly a surprise; in other cases, while seemingly a surprise at the time, upon further reflection perhaps it should not have been. In either event, personnel safety can easily be at higher risk during extreme events, as these situations tax critical thinking given they are outside the common fire experience.

For this project, we employed a novel methodology that used micro-stories gathered from firefighters about their experiences with unusual, impressive, or surprising wildfire behavior. In combination with a quantitative question framework, these individual observations form a dataset that focuses on identifying weak signals and patterns in the context surrounding these events. Concurrently, a quantitative assessment of the several extreme wildfires has examined the climate conditions surrounding these events. If, as there appears to be, a convergence of fire extremes and the triangle of climate, fuels and people—understanding the relationships between these elements, which are likely to be weak signals that can move into alignment, will be integral to gaining a better understanding public and firefighter safety under hotter, drier, conditions.

This presentation discusses project results that focus on understanding the situational factors and context behind firefighters' observations about unusual or surprising wildfire behavior to 1) determine if situational awareness factors

can be identified to lessen the surprise of these events; and 2) provide recommendations that incorporate knowledge of extreme events into fire management training.
Keywords: Fire extremes, large fires, human factors, climate, fuels, fire behavior, risk, safety

Bio: Dr. Tamara Wall is an assistant research professor at the Desert Research Institute and works with the Western Regional Climate Center, the Center for Climate, Ecosystems, and Fire Applications, and the California-Nevada Applications Program (part of the national NOAA-sponsored Regional Integrated Sciences and Assessments network). Current projects include (1) a co-PI on a USDA AFRI sponsored project using a participatory modeling approach in the Tahoe Basin, (2) Working with agencies and organizations in southern California to develop the Santa Ana Wind Threat Index and (3) as lead PI on the Fire Extremes project with the USFS Wildfire RD&A group.

128. Fire Extremes and the Triangle of Climate, Fuels and People (Part 2)

Presenter(s): Timothy J Brown

Additional Author(s):
Nick J. Nauslar, Graduate Research Assistant, Desert Research Institute
Tamara U. Wall, Assistant Research Professor, Desert Research Institute

Over the past decade or so, statements by fire personnel claiming unusual fire behavior beyond training or experience levels seem to be increasing. Concurrently, climate and weather extreme events have been increasing, fuel loads have notably increased due to both natural occurrence and management practices, and human populations have been expanding into the wildland and rural interfaces. All of these factors appear to be intersecting causing an increase in "extreme" fire events based on another fire triangle of climate, fuels and people. Sometimes fire personnel are surprised at how large a fire becomes. In some cases, the extreme event is truly a surprise; in other cases, while seemingly a surprise at the time, upon further reflection perhaps it should not have been. In either event, personnel safety can easily be at higher risk during extreme events, as these situations tax critical thinking given they are outside the common fire experience.

In Part 1 of this project presentation, the methodology of gathering micro-stories from firefighters about their experiences with unusual, impressive, or surprising wildfire behavior is described. These stories represent the firefighters perception of the event. Linking physical environmental aspects of fire to human perceptions of extreme fire and surprises is challenging. It requires a quantitative assessment of fuels, weather, climate and fire behavior that corresponds to the event. Part 2 of this project presentation describes utilizing case studies of environmental conditions that correspond to a set of firefighter narratives. Utilizing quantitative information based on factors such as fire danger, fire behavior and weather, these elements can be examined for their statistical representation of an extreme event. The degree of extremeness can then be assessed in the context of the firefighter perception.

The overall project goal is to examine a convergence of fire extremes and the triangle of climate, fuels and people—understanding the relationships between these elements, which are likely to be weak signals that can move into alignment. This is integral to gaining a better understanding public and firefighter safety under hotter, drier, conditions. This presentation, Part 2 of 2, describes the physical environment components of extreme fire and the relation to firefighter perceptions.

Keywords: Fire extremes, large fires, human factors, climate, fuels, fire behaviour, risk, safety

Bio: Dr. Tim Brown conducts applied research and applications development at the Desert Research Institute in Reno, Nevada. His primary academic interests include analysis of wildland fire-climate and fire-weather connections; the fire environment; applications development for wildland fire management planning, decision-making and policy; the interface between science and decision-making; and co-production of knowledge. Dr. Brown is Director of the Western Regional Climate Center, and established and directs the Program for Climate, Ecosystem and Fire Applications (CEFA) at the Desert Research Institute in Reno, Nevada. He is also graduate faculty in the Atmospheric Sciences Program at the University of Nevada, Reno.

POSTER PRESENTATIONS

P1. Forest Fire Safety Handbook: updating training literature for the Spanish spoken community

Presenter: Raul Quilez

Additional Author(s):
Enrique Mérida, Researcher, Universidad de Cordoba
Joaquin Ramirez, Principal, Technosylva

Statistics show that from 1910-2013 in US there is a record of 1075 deaths from wildfires. In Spain, many fighters were injured and 276 killed in Spain working on forest fires from 1979-2010 (Cardil & Molina, 2013).

Publications regarding safety in forest fires suppression are widely dispersed and mostly in English, which makes them quite inaccessible to the different Spanish spoken crews and staff.

This manual collects in a logical and updated way all the knowledge in fire safety issues. It starts with Fire behavior (Chapter 1), followed by extreme fire behavior and surprising phenomena (Chapter 2), followed by a deep analysis of existing safety standards (Chapter 3). It follows with best ways to apply safety procedures to most common workflows (Chapter 4). A summary of accidents and incidents, that can serve to any unit to review safety standards are addressed, with a special emphasis on what triggered these entrapments (Chapter 5). Finally, we conclude by proposing a training program, with a series of safety exercise that units can apply to improve the safety in their daily work (Chapter 6).

Keywords: fire safety, fire behavior, study cases, training materiasl

Bio: Raul holds a MsC Wildfires (MasterFuego program) and a BsC in Forestry. He works for the Valencia Firefighters agency as Foresty specialist and Incident Commander from 2003. He has a long experience in extreme behavior fires in Mediterrranean areas since 1992, being one of the most respected professionals in Spain, with collaboration in national training.

P2. Interactive 911 Program

Presenter: Sandra Inman-Carpenter

Additional Author(s):
Tiffanie Santi-Sachse Lead prevention Officer
Kevin Robinson Prevention Technician

The 911 presentation is an updated version of the 1980's 911 model created by the state. What we have done on the Stanislaus is improve this program and use available technology to make it even more appealing and realistic to kids, as well as covering the four learning styles (visual, kinesthetic, auditory, and reading) by creating an interactive version that consists of ten 3-4 minute video's depicting real life incidents as the incident/accident progresses. We teach the important things they need to know such as; their addresses, phone numbers, landmarks, cross streets - and of course when it's appropriate to use the 911 system and how to use it correctly.

A 'Student' is chosen from the classroom/audience to be the one to call our 'mock' 911 dispatcher (they are prompted to do so in the video). And while only one student does the actual "reporting" - we encourage the whole class to help out the reporter if they get stuck (as 3rd graders frequently do).

Statistics have shown that role playing is an especially good way to address various emergency scenarios and give your kids the confidence they'll need to handle them. (Kids Health,2010)

Bio: Started my fire career with the California Conservation Corps in 1987 on a hand crew and cook specialist at the Santa Clara CCC Fire Center. Started working as a fire fighter with CDF, Napa California in 1991 where I began my volunteer in prevention with CDF in 1993. In 2001 I started working with US Forest Service as a fire engine operator in Nevada and continued to volunteer in prevention activities. In 2007 I became the Lead Prevention Technician on the Calaveras Ranger District and received my BS in Criminal Justice and Investigations in 2010.

P3. The Role of Departments of Transportation in Wildfire Response

Presenter: Wesley Kumfer

Additional Author(s):
Micah-John Beierle, Independent Researcher
Sanjaya Senadheera, PHD, PE, Texas Tech University
Phi Nash, PE, Texas Tech University

The state of Texas suffered a devastatingly serious wildfire season in 2011. In order to better prepare for future fires and to more effectively use available resources, the state determined that additional training for emergency assets was necessary. As one of the supporting agencies responsible for wildfire management, the Texas Department of Transportation (TxDOT) determined that the maintenance division needed to be properly instructed as to how to most safely and effectively be deployed for wildfire response. The Texas Tech University Center for Multidisciplinary Research in Transportation (TechMRT) was contracted to develop and provide this training.

The TechMRT research team developed an in-depth training program through several steps. First, an in-depth literature review was conducted to determine how TxDOT fits into the hierarchical structure of the state Emergency Support Function (ESF) annexes and what its specific role was in the wider state emergency management framework. Second, six training modules were developed to address the following topics: wildfire response overview, organization and communication, equipment and resources, safety, data collection and management, and training materials. Last, these six modules were incorporated into an implementation project, and nine Wildland Fire Management Training Workshops were hosted.

The results of these workshops exceeded expectations. Course responses indicated a unanimous level of approval for the training, and oral communication revealed a dire need for improved training, particularly regarding safety and education, that was met by the implementation workshops. Attendants felt that after the workshops they better understood their role in wildfire response and management and could make better assessments of risk. Overall, this project revealed the critical functions and supportive roles for departments of transportation in wildfire management.

Keywords: Department of Transportation,Wildfire Management,Safety,Organization

Bio: Wesley J. Kumfer, M.S., is a research assistant and graduate course instructor at Texas Tech University. He has co-authored over 15 research reports, IAC reports, and research products on behalf of the Texas Department of Transportation (TxDOT) in the areas of traffic engineering, corridor analysis, bicycle policy, strategic research, and wildland fire response. Additionally, his doctoral research focuses on transportation and traffic safety. Mr. Kumfer is passionate about education, and began teaching courses and attending educational workshops in early 2013.

P4. Gender and Leadership in Wildfire Suppression: Women Leaders on the Fireline

Presenter: Rachel Reimer,MA Candidate, Royal Roads University

Introduction:
Recent research has characterized wildland firefighting as a "highly masculinized occupation" (Pacholok, 2013, p. 13) and as a "means through which traditional gender roles and power relations are maintained" (Eriksen, 2014, Intro para. 3). The "marginalisation of emotion[sic]" and a "masculine way of engaging with risk" in the ranks of wildfire suppression

agencies have necessitated that women engaging in fireline roles must comply with and model the masculine culture (Eriksen, 2014, p. 129). One case study describes a binary within wildfire, wherein "good firefighters are masculine, and bad firefighters are unmasculine or feminine" (2013, p. 55). The most recent research on gender and wildfire provides comprehensive insights from Australia, the United States, and Canada. Eriksen, in her comparative work based in New South Wales, Australia and California, U.S.A., concludes that "the gender issues...clearly cut across geography and employment status" (2012, p. 129). Both Pacholok and Eriksen question the individual agency of female wildland firefighters as being capable of affecting positive change in the realm of gender (Eriksen, 2012, p. 146; Pacholok, 2013, p. 102). And yet positive change is happening (Pacholok, 2013, p. 114). Women have entered the fireline and have progressed to earn positions of leadership within many wildfire suppression agencies.

Research Question
There are women in fireline positions of leadership who constitute "boots on the ground" - whose daily "micro-level, face-to-face interaction(s) can also spark change" (Pacholok, 2012,p. 113). This study seeks to understand if / how women in operational, fireline-based positions of leadership are creating and sustaining positive Prepared by Rachel Reimer for the International Association of Wildland Fire change in wildfire suppression. Are there commonalities between women successful in leadership within wildfire suppression - in personality, leadership style, interpersonal relationships with supervisors, peers, and subordinates, and in their level of task related fireline skills (e.g. chainsaw operation)? If there are commonalities, can these successful habits of women leaders on the fireline be taught, trained, or facilitated at a program-wide level? This study seeks to assess the currently existing successes that wildfire suppression agencies are experiencing among women leaders, and to build on these successes in a way that is relevant and directly meaningful to wildland firefighters at all levels.

Bio: Rachel Reimer earned a BA in International Development Studies from the University of Winnipeg in 2010. During her studies she conducted research with the U.N.W.R.A. Lebanon
Women's Program on capacity building for women leaders in refugee camps. She worked for the Institute for Community Peacebuilding in Winnipeg, MB facilitating nonviolent
communication. She is undertaking her MA in Leadership Studies at Roads University (Victoria) 2015-16. She is an Initial Attack Crewleader with the British Columbia Ministry of Forests, Lands, and Natural Resource Operations, Wildfire Management Branch. This is her fifth season on wildfire suppression crews.

P5. The Sounds of Wildland Firefighting in Action: Communication Research Study

Presenter: Elena Gabor

Additional Author(s):
Rebekah L. Fox, PhD, Assistant Professor, Texas State University
Dave Thomas, Renoveling, Ogden, Utah
Jennifer Ziegler, PhD, Associate Professor, Dean of Graduate School, Valparaiso University
Anne Black, PhD, Rocky Mountain Research Station

The goal of this poster presentation is to share what we have learned about the process of conducting research on radio communication practices in wildland fire. How people talk to each other using radios and other communication devices during an incident to maximize principles of high-reliability organizing mindfulness is not well understood. Furthermore, the current training in radio communication best practices tends to be mostly informal and inconsistent across fire organizations. By focusing attention on how interactions and sensemaking in the field are shaped by available technologies, this study, funded by the Joint Fire Science Program, seeks to benefit members of the inter-agency wildland fire community and the human factors research community.

Specifically, our research project seeks to accomplish the following goals: (a) to understand how people make sense of radio messages on an incident while distributed geographically; (b) to understand opportunities as well as practical and cultural constraints within current radio and other practices for communicating risk; and (c) to understand how interactions in the field are shaped by the available technologies.

Although our overall goal may seem straightforward, the process of researching radio communication in wildland fire is complex and presents several obstacles. Our study involves observing communication in multiple contexts (active fire incidents, training simulations, and dispatch centers) as well as conducting follow-up interviews, and analyzing actual radio transmissions. This poster will reveal the steps that have been taken to accomplish this type of research with the

intent of producing research articles and conference presentations that contribute to both theory and practice and increase firefighter safety. We will discuss developing project goals, interviewing people in the field, navigating human subjects review processes, and the producing materials such as "Informed Consent Forms," "Interview Protocols" and "Observation Protocols", etc.). Additionally, we plan to engage IAWF conferences goers in a conversation about our project in order to learn from their experiences communicating on wildland fires. We hope that by introducing this study to the IAWF community during the combined Safety Summit and Human Dimensions Conferences, we will gain feedback on our methods and support for our study.

Keywords: radio; communication; sensemaking; research protocols

Bio: Elena Gabor received her B.A. in Journalism and her M.A. in Media Management from the University of Bucharest, Romania. Subsequently, she received a second M.A. in Communication from Virginia Polytechnic Institute and State University (Blacksburg, VA) and her Ph.D. in Organizational Communication from Purdue University (West Lafayette, IN). Elena Gabor has been at Bradley University since 2008, where she has taught courses in the Organizational Communication unit. Her research interests focus on radio communication in wildland fire, organizational resilience, and sensemaking.

P6. Social "Watch Out" Situations for Incident Management Teams

Presenter: Toddi Steelman

Additional Author(s):
Branda Nowell, Associate Professor, School of Public and International Affairs, North Carolina State University
Clare FitzGerald, School of Public and International Affairs, North Carolina State University
Mary Clare Hano, School of Public and International Affairs, North Carolina State University

In addition to managing the biophysical aspects of large wildfires, Incident Management Teams (IMTs) must also manage the social aspects of the fire. However, we have a much more sophisticated understanding of the biophysical risks related to wildfire than the social risks. Land cover type, topography, soil moisture, humidity, fuel loads, wind, and weather are common in the vocabulary of most fire managers. We are much less conversant in the language related to risks for problematic communication and coordination among responding agencies and how these risks can be assessed and managed. However, many experienced IMTs implicitly manage for these social or relationship risks during a wildfire. We harvested the experience of 24 highly experienced fire managers, which included US Forest Service and Bureau of Land Management Fire Staff, Fire Chiefs, State Forestry officials, Forest Supervisors, and Sheriffs, all of whom served on IMTs in different capacities from across the United States (10 states) so that we might more explicitly and systematically understand those risks and share that knowledge. We further worked with Area Commanders, Incident Commanders, and Deputy Incident Commanders to identify and confirm the top most challenging social watch out situations faced by IMTs and the social watch out situations most commonly faced by IMTs. Articulating this list and providing some discussion about these situations and what can be done to effectively manage them could lead to better safety outcomes for IMTs.

Keywords: Social Watch Out Situations, Risk Management, Communication, Incident Management Teams

Bio: Toddi Steelman is Executive Director and Professor, School of Environment and Sustainability (University of Saskatchewan). Her research focuses on improving the governance of environmental and natural resources, emphasizing science, policy, and decision-making interactions. She places special emphasis on the role of the public and community in decision-making. She is Co-director, with Dr. Branda Nowell, of the Fire Chasers project at North Carolina State University (research.cnr.ncsu.edu/blogs/firechasers/).

P7. Australian volunteer rural fire brigades: the value of historical perspective

Presenter: Sandra Lauer

Wildfire has shaped much of Australia's ecological landscape and is a fundamental part of those ecological processes. However, fire has not only changed the ecological landscape in Australia. It has also shaped how Australians think of themselves as a people. Every local community has its own memories of fire; stories of survival, disaster and heroism. Some of these events, such as the 1939 Black Friday fires, the 2009 Black Saturday fires in Victoria and the 2003 Canberra

Firestorm, are etched in the story of the nation. Other smaller, localised bushfire events also have long lasting impacts on local communities, even if they are relatively unknown elsewhere.
Understanding historical events as trigger points and analysing supporting historical documents, personal stories, narratives and photos provides an opportunity to unpack "wicked problems" that are often seen as being unsolvable. The professionalisation of fire management is one such "wicked problem" that has emerged as being a catalyst for disharmony.

Volunteer rural fire brigades are an essential part of these local and national historical narratives about fire and their histories are a valuable means of understanding how fire regimes and responses to fire have changes over time.

This paper will present preliminary research findings on the changing functions of such volunteer rural fire brigades in the Monaro region, New South Wales. The paper will explore how such an in-depth historical analysis enriches the development and understanding of some of the key research questions being asked. In this way, the paper argues that historical analysis is an important method for providing context for fire-related research but also sheds new light on current "wicked problems", such as the professionalisation of fire management, that have evolved in response to complex local, national and international pressures.

The paper also suggests that historical analysis can then help inform future fire management strategies within New South Wales and Australia, within the broader context of national policy changes.

Keywords: volunteer rural fire brigades, Australia, New South Wales, Monaro, history, narrative, bushfire, wildfire, case study, sociology, fire management

Bio: Sandra is a PhD scholar in the Department of Sociology at the Australian National University. She completed her Masters degree in Geographical Sciences in 2010. Sandra is also an active volunteer firefighter in the NSW Rural Fire Service.

P8. Fire Adapted Communities Learning Network

Presenter: Michelle Medley-Daniel, Fire Adapted Communities Network Program Manager, The Watershed Center

The Fire Adapted Communities Learning Network (FAC Network) is an innovative approach to accelerating wildfire adaptation efforts across the US. Modeled after the Fire Learning Network, which has been operated by The Nature Conservancy and their federal and community partners for nearly a decade, the FAC Network connects communities that are working to create more resilient landscapes, communities and institutions.

The multi-scalar, cross-sector approach to adaptation that is being demonstrated by FAC Network participants offers lessons about resilience, community relationships to fire, and varied organizational cultures and approaches. Brief case stories profiling several of the communities participating in the FAC Network will offer attendees insight into how these communities are learning, adapting and sharing innovations and best practices.

Bio: Michelle Medley-Daniel is the Watershed Research and Training Center's Fire Adapted Communities Learning Network Program Manager. In her role she both manages the network's operations for the organization, and also acts as a liaison in the network—directly working with communities throughout the west to improve their wildfire resilience. She holds bachelor's degrees in English and Studio Art from Humboldt State University. For the past ten years Michelle has been coordinating networks of environmental educators and rural communities, as well as providing communications and development services to non-profits.

P9. Knowledge for Wildfire; improving management of UK wildfire through knowledge exchange

Presenter: Julia McMorrow, Senior Lectuer in Remote Sensing and NERC Knowledge Exchange Fellow, University of Manchester, UK

Bio: Julia is a physical geographer and Senior Lecturer in Remote Sensing at the University of Manchester (UK). She holds a nationally-funded Knowledge Exchange Fellowship, leading the Knowledge for Wildfire project. Previously, she led the FIRES seminar series – fire interdisciplinary research on ecosystem services. As a member of the England and Wales Wildfire Forum and other national fire-related groups, she works closely with the Fire Services, land managers

and other stakeholder communities to help provide evidence-based recommendations on wildfire policy. Her action research includes using satellite and Fire Service data to analyse spatial and temporal patterns of UK vegetation fire risk.

P10. Students of Fire: Local actions to support global issues

Presenter(s): Kelsy Gibos MSc., Wildfire Management Specialist, Edson Wildfire Management Area, Forest & Emergency Response Division, Alberta Environment & Sustainable Resource Development

Additional Author(s):
Roger Strickland, Senior Instructor, Country Fire Authority
Rod Stebbing, Principle Consultant, Emtrain Fire & Community Safety Pty Ltd

Paul Gleason left a legacy of thinking firefighters whose safety was linked to their application of fire science principles at the fireline. His vision fostered experiential learning where knowledge was passed from those bearing battle wounds of near-misses to those just beginning their inherently risky wildland fire career.

Australian wildfire educators Roger Strickland and Rob Stebbing have co-founded a unique community of practice called Students of Fire (SoF) under the auspices of IAWF. Driven by their personal experiences with a near-miss tanker burnover, SoF was developed as a platform for sharing. SoF is about activity and continual improvement; it is about local action to learn about a global issue. It builds connections across the wildfire community and a dialogue between firefighters, researchers, local government authorities, educators, and all those with responsibilities in wildfire.

SoF recognizes the value in informal sharing of personal experiences; it is born from those in-camp-after-dinner reflections between strangers on what was supposed to happen, what really did happen and attempts to explain discrepancies. It arises from a need to fuzz out jurisdictional borders and a desire to challenge the science of fire behaviour prediction. SoF is for thinkers; it is about inquiry and a search for understanding. It is a safe place to ask questions, to step outside of the boundary of the 'norm' and to challenge the use of terms like 'unprecendented', 'unexpected', 'extreme' and 'unforseen'.

This presentation outlines the mission of the Student of Fire project and provides details on how to participate at the workplace level. It is delivered by a practicing SoF who will provide tips to help ignite mindfulness about the relationship between science and safety and encourage calibration based on personal experience.

SoF highlights that the language of fire amongst those who observe it is universal. Comradery is widespread amongst personnel whether it is national or international boundaries that are breached by a spreading fire. Emergency management environments change over time and space, but the mathematics of fire spread and the feeling of heat on skin will remain the same.

Keywords: Students of Fire, Paul Gleason, experience-based learning, global fire community, lessons learned

Bio: Kelsy Gibos is a fire behaviour specialist who has observed and studied fire behaviour in Canada, New Zealand and Australia. Her experiences abroad have ignited an interest in sharing lessons learned especially with regards to the application of science at the fireground. Her focus is in finding a way to translate complex, peer-reviewed scientific information into practical, on-the-ground feet-in-the-ash applications. She currently resides in Edson, Alberta, Canada with her partner Travis and their two Australian cattle dogs.

P11. The Incident Risk Console (RisC) – A Risk Assessment Synopsis for Wildland Fires

Presenter(s): Lisa Elenz, Deputy Program Manager, Wildland Fire Management Research Development & Application program, Rocky Mountain Research Station, US Forest Service

Additional Author(s):
Thomas Zimmerman, Senior Wildland Fire Consultant, Tom Zimmerman Consulting
Sean Triplett, Geospatial Manager, US Forest Service Fire and Aviation Management
Morgan Pence, Fire Application Specialist, US Forest Service Wildland Fire Management RD&A
Mitch Burgard, Fire Technology Transfer Specialist, US Forest Service Wildland Fire Management RD&A
Jill Kuenzi, Geospatial Coordinator, US Forest Service Fire and Aviation Management

Wildland fire complexity is increasing dramatically and presenting difficult problems and concerns for wildland fire management agencies. To improve decision-making and management capability, managers need more and better information about changing fire dynamics. Numerous information management systems exist and others are under development to provide improved wildland fire information, but systems providing risk assessment information are currently lacking. As a result, the US Forest Service National Director of Fire and Aviation asked if a new system to access and display such information from a variety of sources could be designed. The Incident Risk Console (RisC), a data analytics dashboard and business intelligence tool for wildland fire decision makers, was developed to provide national fire program managers with relevant fire information for emerging and complex ongoing wildfires. RisC information goes beyond available fire statistics and includes specific calculated information and indices that afford a visual risk assessment synopsis for wildland fires, an early alert/risk assessment for potential problem areas, and an overview summary of national and regional incidents. RisC includes eight specific risk attributes that summarize a range of conditions and activities on a fire-by-fire basis. These are: values Inventory, jurisdictions, significant fire potential, relative risk, suppression capability, aviation exposure, modeled values at risk, and modeled suppression effectiveness. The initial Incident Risk Console represents the transformation of an idea into an actual system. The 2014 fire season allowed for a test and an evaluation of its applicability. It was found to have specific value in providing new information useful in: clarifying the overall fire situation, understanding individual fire dynamics, and improving understanding of the effects of management decisions.

Keywords: risk assessment, information technology, decision-making

Bio: The WFM RD&A provides the latest research to the field through the development of tools, training, and by providing decision and analysis support. Until fall 2009 she was the FMO at Grand Teton National Park, previously working as the AFMO. She worked seasonally on crews and engines at Grand Canyon and Yosemite National Parks until she was hired permanently 1994 working in suppression, prescribed fire, fuels management, structural fire and emergency operations. She graduated from college in with a General Chemistry Degree, minoring in Mathematics and Nutrition from Northern Arizona University.

P12. Fire in Southern Ecosystems

Presenter: Adam Kent, Ecologist, Normandeau Associates, Inc.

Additional Author(s):
Christine Denny, Principal Scientist, Normandeau Associates, Inc.
Jim Brenner, Fire Management Administrator, Florida Forest Service

An important obstacle to prescribed burning has been the lack of effective, coordinated, targeted fire education programs. Because financial support often results from public support, it is important to have a constituency that supports prescribed fire. In general, residents of the southeastern United States do not have a good understanding of prescribed fire or of the natural role of fire. Understanding these two concepts is important for the public, especially in Wildland Urban Interface areas where wildfire risk is high.

Many Florida fire managers believe Florida's severe wildfires of the late 1990s resulted from fuel buildup due to public resistance to prescribed fire. At that time in Florida, very few public school teachers and a smaller number (than might be expected) of park and nature center staff were regularly teaching about fire. The Fire in Southern Ecosystems (FISE) curriculum was started in Florida as a Florida-specific program to provide educators with the background, knowledge, and skills they need to teach about fire. FISE is a free workshop and curriculum package for educators of all types. The goal of the FISE program is to engender a citizenry that supports prescribed fires. The program is expanding from Florida to other states in the Southeast and can be used as a model for fire education programs in other regions as well.

Evaluation is key to improving the FISE program over time. A needs assessment was conducted and received input from more than 1,200 educators. Participants show statistically significant changes in knowledge and attitudes about fire immediately after, and even years after, attending a workshop. During more than 150 workshops in the past 15 years, this program has reached 95% of the school districts in Florida and more than 3,000 educators, with a potential impact of more than 1 million people. Workshops are coordinated and taught by Normandeau Associates, Inc., for the Florida Forest Service. The FISE curriculum and teaching resources are available to download for free from www.fireinsouthernecosystems.com.

Keywords: Fire, Southeast, Southern, Ecosystem, Education, Program, Community, Resiliency, Teach, Educator
Bio: Adam Kent is an Ecologist with Normandeau Associates with more than 20 years of professional experience as a wildlife biologist. His background includes securing funding for fire teams across the Southeast and instructing on fire ecology. Adam has written management guidelines, management plans, and educational materials that incorporate fire.

P13. What We Talk About When We Talk About Fire: Words, Media, and Wildfire

Presenter: Alexandra Weill, Graduate Student Researcher, UC Davis

Additional Author(s):
Jeff Kessler, Graduate Student Researcher, UC Davis

News articles, blogs, and other media can shape the way that people understand and perceive wildfire, and public perception can play a large role in wildfire policy. Using online databases of news articles and blogs and natural language processing techniques, we examine the most common words and phrases in wildfire-focused writing to uncover patterns in tone, word-choice, and coverage of topics including destruction of human structures, firefighting, climate change, ecology, and policy. We test the hypothesis that disaster-focused reporting is common and ecological content rare, which could limit understanding of broader issues in fire science and shape opinions on the use of fire suppression, prescribed fire, or other management strategies. We break down the data by region and time period in order to reveal trends over time and understand whether local fire history is reflected in wildfire media. These data will help those in the wildfire community understand what messages the public may be receiving and lay the groundwork for broader study in fire communication and education.

Keywords: wildfire, communication, news articles, language processing, public perception

Bio: Alexandra Weill is a PhD candidate in the Graduate Group in Ecology at UC Davis. Her research focuses on the effects of changing fire regimes on plants, ecological communities, and people and seeks to understand the resilience of both ecosystems and human society in the face of climate change and development of the wildland-urban interface.

P14. Big questions, local answers: Awareness and preparedness of unprepared people in Idaho

Presenter: Elise Thiel, Boise State University

Additional Author(s):
Dr. Thomas Wuerzer, Assistant Professor, Boise State University

This poster presents two aspects of wild fire related research. First, it shows briefly the educational outreach within the NSF Idaho EPSCoR program with a focus on wildfires. The Experimental Program to Stimulate Competitive Research (EPSCoR) in Idaho inspires undergraduates to explore research experiences in new emerging fields at graduate level.

Second, as the fire and social sciences aspect, this poster presents localized answers, with emphasis on the Treasure Valley and Boise, Idaho, to the increased presence of wildfires and the likelihood to influence the level of awareness and preparedness of residents in a specific area. These impacts depend on duration, re-occurrences and magnitude of the hazards, yet also on the institutionalized memory of the community and the places where the hazards occurred.

Using a complex dataset on wildfire risk and awareness at the wildland urban interface focusing on university population, this poster shows the relationships between homes and residences and areas of perceived high wildfire risks. Utilizing GIS and statistical methods, we spatially explore disconnects between being aware, prepared, and unaware/unprepared in a select population that has or has not property ownership.

Anticipated results of this study will support a) future regional planning and wildfire mitigation efforts, and b) the understanding of socially vulnerable population without property that is equally at risk compared to homeowners.

Keywords: Socially vulnerable population, perceived risk, disconnects

Bio: Elise Thiel is an undergraduate of Environmental Studies at Boise State University and native to Idaho. She worked as a park ranger in Idaho and scheduled to graduate in May 2015. Her interests are wildfires and water issues. She was

awarded to the 2014-2015 NSF Idaho EPSCoR MURI program. Over the course of 4 months, she explores graduate studies as a research assistant to Dr. Thomas Wuerzer on topics of wildfires, regional planning, and social vulnerability.

P15. Collaborative Landscape and Community-Level Wildland Fire Management Planning and Implementation within the Resort Municipality of Whistler, British Columbia, Canada

Presenter: Nicholas O. Soverel, B.Sc. (University of Vermont), M.Sc. (University of British Columbia), Forester-in-Training

This poster presents an example of successful fire and fuel management planning within the Resort Municipality of Whistler (RMOW) through the collaboration of local and provincial government, forest consultants, First Nation representatives, timber licensees, and private land owners.
B.A. Blackwell and Associates, Ltd. began the process of developing and implementing various wildfire management plans and prescriptions for the RMOW in 2005. Since 2005, our firm completed a Community Wildfire Protection Plan (CWPP) with an update to this plan in 2011. Successful implementation of the CWPP has included individual fuel treatments projects in high-value neighbourhoods and immediately adjacent to the Whistler Blackcomb ski development and adjacent hotels and infrastructure. In 2013 our firm was engaged in developing a landscape-scale fire behaviour modeling report to the municipality which has been implemented through the treatment of one of the eleven primary fuel breaks identified in this analysis. In the summer of 2014, B.A. Blackwell participated in direct consultation with private landowners through the use of the Provincial B.C.'s FireSmart program. These highlighted projects in conjunction are an example of successful local government planning and provides a potential model to protect communities in other municipalities

Bio: Nick joined B.A. Blackwell & Associates Ltd. in 2013 and leads Blackwell's Specific Claims research and report writing effort. He works in the areas of fire and fuel assessment and management within the Resort Municipality of Whistler. He also works in timber harvest planning and cruising within the Interior of British Columbia.

Prior to joining the Blackwell team, Nick worked as a Rangeland Data Specialist where he analyzed and processed large amounts of ecological information for research and land management purposes. Nick was a member of the Integrated Remote Sensing Studio within UBC's Faculty of Forestry where he researched the topic of characterizing burn severity using remote sensing techniques within western Canadian National Parks.

P16. BRINGING THE FIRE ADAPTED MESSAGE TO ADA COUNTY

Presenter: Jerry McAdams

The Fire Adapted Communities Learning Network (FACLN) encourages the development and sharing of best practices to accelerate the adoption of fire adapted community concepts nationwide. The FACLN supports eighteen hub organizations and pilot communities that have committed to implementing and sharing the FAC-centric work that they are conducting, in order to increase their communities' resilience to a real and historic threat of wildfire. Funding for the FACLN is provided by the USDA Forest Service's Fire Adapted Communities Program and participants' matching funds. The FACLN is cooperatively managed by the Watershed Research and Training Center and The Nature Conservancy.

Meeting one of the focal points of the National Cohesive Wildland Fire Management Strategy of creating Fire Adapted Communities, the Boise Fire Department, in partnership with the FACLN, acts as the hub organization for the Ada County FAC. One of the underpinning values of the FACLN is that "Collaboration and partnerships are keys to successful adaptation." In this spirit, the City of Boise Wildfire Mitigation Team (WMT) has taken great strides to identify stakeholders and build collaborative partnerships, both internally and externally.

The City of Boise has created an interdepartmental Wildfire Mitigation Team (WMT), comprised of individuals from Fire, Parks, Planning and Public Works. Boise City staff have successfully partnered with federal agencies, not-for-profits, local university research teams, local environmental study groups, volunteer organizations, civic groups, small businesses, developers, as well as homeowners' and neighborhood associations, to reduce wildfire risk and increase community awareness. Through the relationship with the FACLN, the City of Boise WMT has had the privilege and opportunity to network and exchange ideas with other FACLN hub organizations throughout the United States. In additional, the association with the IAWF has also provided international networking opportunities for the City of Boise WMT.

This poster presentation will highlight many of these collaborative partnerships, as well as several years of FAC-centric work in Ada County.

Keywords: Fire Adapted Communities Learning Network Ada County FAC FACLN Partnerships Best Practices Collaboration National Cohesive Strategy

Bio: Jerry McAdams is the Wildfire Mitigation Coordinator for the Boise Fire Department, where he has worked for 15 years. He serves on City of Boise and Multiagency Wildfire Mitigation Committees. He is a Board Member for the International Association of Wildland Fire and holds an NWCG certification as a Wildland Fire Investigator. Jerry has previously presented at Backyards & Beyond, a Ready, Set, Go! webinar, an Idaho Power luncheon and at the Southwest Idaho Wildfire Mitigation Forum. Jerry has a Bachelor of Science in Psychology from Boise State University. He enjoys working with communities and seeking new, cooperative partnerships.

P17. Ranching with Fire: Livelihoods, Resiliency and Adaptive Capacity of Rural Idaho

Presenter: Kyle McCormick

Additional Author(s):
Thomas Wuerzer, Ph.D, Assistant Professor, Boise State University

Wildfires have different faces – the spectacular forest fires and the equally devastating rangeland fires. This poster presents the challenges of rural areas that are in close proximity to fire prone areas presenting high risk not only by the fire event but also by its long-term effects. The threat that wildfire poses for rural communities goes beyond personal and household safety, but also threatens to diminish their economic livelihoods-- being a multidimensional threat.
An increase of fire activities suggests the threat of post-event impacts such as the greatly reduced availability of summer ranges on federal land for livestock grazing. The time-consuming restoration efforts of federal rangelands results in additional extreme hardship on such communities. This situation creates tension between federal agencies, ranchers, and other involved stakeholders due to the amount of efforts spent in preparing, responding, and recovering. The high personal/economic value of property in these areas creates a higher risk associated with wildfire, therefore creating a necessity to consider creative solutions for adapting. The adaptive capacity and resilient nature of rural ranching communities depend on regional planning efforts to coordinate and collaborate on mitigation efforts for pre-fire activities, timely response during the event and post-fire restoration actions.
Within Idaho, one such effort is to create better regional partnerships and cohesion with the Rangeland Fire Protection Associations (RFPA) program. The RFPA program, headed by the Idaho Department of Lands, gives rural communities a platform on which to build regional adaptive capacity. This program aids ranchers with training to be first responders to wildfires and the opportunity to create a collaborative relationship between themselves and government agencies.
This poster will present findings on how the RFPA's regional planning efforts can create rural town resiliency. This includes lessons learned and reflections of existing Idaho RFPA's. This case study on rural wildfire mitigation is supported by semi-structured interviews, and spatial analysis using GIS.
Anticipated findings will help planners (federal, state and local), firefighters, RFPA's, and range management specialists to gain a better understanding of the livelihoods at stake and the adaptive capacity of ranching communities and therefore create resiliency.

Keywords: resiliency, vulnerability, ranching, rangelands, wildfire

Bio: Kyle McCormick will receive his Masters of Community and Regional Planning from Boise State University in the Spring of 2015. Kyle spent two summers working in Stanley, Idaho where he experienced two large wildfires that had critical implications for the small rural town. From then on he has been interested in how communities can become better prepared for large wildfires. At Boise State University he works and researches with Dr. Thomas Wuerzer on issues in the wildland urban interface. Kyle has engulfed himself as a student of wildfire, and hopes to one day help communities prepare for wildfire.

P18. Enhancing Community Response-Utilising existing information networks during bushfires

Presenter: Kathy Overton

Inquiries undertaken after major bushfires in Victoria Australia invariably mention difficulties with information flow to and throughout communities during bushfires, as well as highlighting that a significant number of people continue to be unprepared for bushfires when they occur.
Considerable improvements in the timing and dissemination of warnings and information during bushfires have occurred since the Black Saturday Bushfires of 2009. Emergency Service Organisations (ESOs) have given increased priority to the provision of information to communities under threat of bushfire. Great emphasis is placed on planning for bushfires, both at personal and community level by fire agencies.

However, people without bushfire plans and people getting helpful, reliable, timely, and tailored information, when and how they need it during bushfires, continue to be major challenges. Understanding how communities communicate and disseminate information outside of times of disasters will help develop strategies that will assist during times of disaster. Connecting existing emergency structures and processes with existing community networks and processes during bushfires and other emergencies must be considered if we are to increase the effectiveness of community response.

Building on a project undertaken in 2011, this presentation discusses ways that local governments and communities (including ESOs), may work together to better utilise existing information networks within communities during disasters. It will also encourage discussion on how new approaches may enhance community response and resilience when bushfires threaten, as well as barriers to changing perspectives.

Keywords: existing, networks, connecting, barriers, trust, complexity, support

Bio: As a result of training as a firefighter during her time as an environmental educator, Kathy Overton went on to work as a fire educator and community engagement specialist for Victorian fire agencies for 12 years.
During that time Kathy was responsible for the coordination of the early development of the AIIMS Information Officer role and training for the Victorian Government's forest firefighting organisation. More recently she has supported fire agencies in the improvement of warnings and community information dissemination during emergencies.
For the past three years her foremost interest has been community response during bushfires, primarily the importance of community networks in dissemination of information.

P19. Fires of Change: An Art and Science Collaborative

Presenter: Andrea Thode, PhD, Associate Professor, Northern Arizona University

Additional Author(s):
Barbara Satink Wolfson, Program Coordinator, Southwest Fire Science Consortium
Andrea Thode, Associate Professor, Northern Arizona University
Cari Kimball, Program Coordinator, Landscape Conservation Initiative, NAU
Collin Haffey, Ecologist, USGS Jemez Mountains Field Station

The Southwest Fire Science Consortium (SWFSC) has expanded its target audience to include the public and based on the success of a similar project in Alaska, we developed an art and science collaborative called Fires of Change. This is a collaborative project with the SWFSC, the Landscape Conservation Initiative and Flagstaff Arts Council. The goal was to create a stronger link among fire, landscape conservation and climate change; making the newest scientific ideas more accessible to non-science oriented audiences through novel media. Bringing science and art together is not a new concept, but perhaps more important in our current world view, considering the changes we face on a global scale. Artists bring unique perspectives which may lead the public to see science differently. As part of the project, we held multi-day field trips to areas around northern Arizona. We visited the North Rim of the Grand Canyon to learn about their successful fire program and we visited the Slide Fire to learn about the successes in promoting ecologically beneficial fire even during a suppression incident. During the field trips, artists, managers and scientists were all present and contributing to conversation about fire ecology, historical fire regimes, changes in the last century due to human intervention and changes occurring due to a shifting climate. Artists will have a year to produce artwork based on what they learned during the field trips.

Keywords: art, collaboration, fire science, public education

Bio: Andrea E Thode (Andi) is Associate Professor of Fire Ecology and Fire Science in the School of Forestry at Northern Arizona University. Andi completed her B.S. and later her Ph.D. in fire ecology through the Ecology Graduate Group at the University of California, Davis. Her research focuses on fire effects at the local and landscape scale. Andi has been heavily involved in the Association for Fire Ecology (AFE) since its inception as a founding board member, education committee chair and member and through development and planning of several regional and national level conferences. Andi has been the Principal investigator for the Southwest Fire Science Consortium since its inception in 2009.

P20. We all play a part- Bushfire Ready Neighbourhoods

Presenter: Peter Middleton, Community Development Coordinator, Tasmania Fire Service. Member of the International Association for Public Participation.

Additional Author(s):
Mai Frandsen, Dr- Reseacher, University of Tasmania

From pilot to program, the Tasmania Fire Service community development approach - the Bushfire Ready Neighbourhoods program.

In 2009 the Tasmania Fire Service embarked on a community development pilot program with the aim of trialling a community development approach to bushfire preparedness in a number of targeted communities that have a higher level of bushfire risk.

Critical to the approach was to build a strong evidence base by collaborating with the University of Tasmania, Australian Fire and Emergency Services Council (AFAC) and the Bushfire Cooperative Research Centre. This included the publication of a PhD thesis by Dr Mai Frandsen in 2012 titled: 'Promoting community bushfire preparedness: Bridging the theory – practice divide'. This collaborative research approach is leading the nation in informing best practice in community bushfire preparedness and has created a sound evidence base in Australia.

Since undertaking this pilot program Tasmania Fire Service has embarked on the implementation of a strategic community development program - Bushfire Ready Neighbourhoods including the employment of dedicated Community Development Officers across Tasmania. This has a long-term goal of embedding community development and engagement in the organisation's culture and the way we work with communities to share the responsibility for bushfire.

Peter will share the key learnings from this research. He will discuss key themes, what has worked, what has not and practical ideas that people working and volunteering at all levels in community bushfire preparedness can take from the research.

Key topics Peter will discuss include:
- 'One size does not fit all' community development approach;
- Case studies from Tasmania;
- Research and human behaviour analysis;
- Best practice community engagement;
- Evaluation techniques;
- Tools, techniques and approaches to building resilience.

National Winner of the 2014 Resilient Australia Award- the award recognises excellence and innovation in disaster resilience.

Keywords: shared responsibility; capacity building; community development; resilience; prevention; preparedness; organisational change; community led approach; engagement; research; evidence base.

Bio: Peter Middleton is the Community Development Coordinator at Tasmania Fire Service in Hobart, Tasmania, Australia. Peter's role develops community capacity to prevent, prepare for and respond to bushfires and fires in the home. Peter coordinates the Bushfire Ready Neighbourhoods program which aims to increase shared responsibility

and has a vision that 'we all play a part- individuals, fire agencies and communities'. A member of the International Association of Public Participation. Peter has hands on firefighting experience as a Volunteer and Remote Area Firefighter in Australia for 15 years.

Peter has a passion for evidence based community development in emergency management which is demonstrated in the success of the program.

P21. Boulder County Wildfire Partners - Home Ignition Zone, Education, Certificates, Case Studies and iPads

Presenter: Ryan Ludlow, Forestry Education and Outreach Coordinator, Boulder County Colorado

Wildfire Partners is a new and innovative way to help homeowners prepare for wildfires. We provide a comprehensive, 2-4 hour assessment of the home ignition zone; a customized report detailing actions homeowners should take; a rebate for mitigation work; and a follow-up certification to ensure that the homeowner is as prepared as possible. In 2014, we easily enrolled our target of 500 homes and conducted 450 assessments.

Meetings between Boulder County staff and some of the nation's leading wildfire mitigation scientists—Jack Cohen and Steve Quarels—helped build our program design. We focus on the need to create effective d-space, retrofit homes and maintain the efforts over-time. The latest social science highlights the importance of education and the need to explain the real hazard homeowners' face. This is why we require each homeowner to actively participate in their home assessment.

Our program is using an innovative home assessment tool, an iPad app, which can be easily replicated in other communities. The app is powerful and allows us to capture photos and annotate them directly in app. Wildfire Partners is rich in data. All data we collect via the iPads is tracked in salesforce, a powerful database. Data can be analyzed by home, fire district, and mitigation measure. We also track the total hard dollars and hours of labor each homeowner contributes. At this presentation we will share our data, case studies and stories from homeowners who are benefiting from the program.
After homeowners complete all required mitigation measures we re-visit their property. If they pass their inspection we issue a Wildfire Partner Certificate. Allstate Insurance has announced their support for the initiative by being the first insurance company to accept our certificate.
The program has proven very popular with participants. In a recent survey, 91% of respondents said they are very likely or likely to refer a friend or neighbor to the program.

Our presentation will provide an overview of our program design, our innovative approach, the iPad assessment tool and why we believe Wildfire Partners is designed for success.
To learn more about Wildfire Partners visit: http://www.wildfirepartners.org/

Keywords: Wildfire Mitigation; Home Ignition Zone; Defensible Space; Home Retrofits; Education and Outreach; Case Studies; Certificates; Technology; iPad Assessment Tools; Mitigating Fire Risk; Understanding Risk; Wildland Urban Interface; Building Resilient Commun

Bio: Ryan Ludlow coordinates the Forest Health Outreach Program for Boulder County in Colorado. Ryan passionately promotes the need for proactive wildfire mitigation and understands the importance of designing effective educational programs. In 2010, the Fourmile Fire ignited in the foothills of Boulder County destroying 169 homes. This fire motivated Ryan and Boulder County to do more to help residents prepare for future wildfires. Over the past few years he has built a wide-reaching educational network that is working. Homeowners are taking personal responsibility and when you visit the foothills of Boulder County you can see the impact.

P22. First Nations Wildfire Evacuation Partnership

Presenters:
Tara K. McGee, PhD, Associate Professor, University of Alberta
Amy Christianson, Fire Social Scientist, Natural Resources Canada, Canadian Forest Service

Thousands of Canadians are evacuated from their homes every year to protect the health and safety of residents during wildfires. Despite comprising only 4% of the Canadian population, almost 1/3 of wildfire evacuations between 1980 and 2007 involved Aboriginal people. In 2011, thousands of residents in 35 Aboriginal communities in Alberta, Saskatchewan and Ontario were evacuated due to the close proximity of the fire, smoke or power outages due to wildfires. The First Nations Wildfire Evacuation partnership brings together researchers, First Nations communities in Ontario, Saskatchewan and Alberta that were evacuated due to recent wildfires, and agencies responsible for conducting or providing support during these evacuations. The aim of this partnership is to examine how First Nations residents and communities were affected by recent wildfire evacuations and identify ways to reduce negative impacts of evacuations on First Nations people. This research will provide participating communities with information about how residents in their own and other communities were affected by recent wildfire evacuations and factors that influenced residents' evacuation experiences. The results of this research may assist First Nations communities to prepare for and carry out future evacuations, and may also assist government agency partners in their evacuation decision making and support activities. This research partnership may also enhance relationships between partnership members and develop a shared understanding of the impacts of wildfire evacuations on First Nations people. The research carried out by this partnership aims to contribute to the evacuation literature by exploring wildfire evacuations in Aboriginal communities, a topic that has received little attention in Canada and internationally.

Bio: Tara McGee is an Associate Professor in the Department of Earth and Atmospheric Sciences at the University of Alberta. For the past 15 years, her research has focused on the human dimensions of hazards, mainly focusing on wildfires. Tara leads the First Nations wildfire evacuation partnership.

P23. INSIGHT + ACTION = RESILIENCE Proven Results from Wollombi Australia

Presenter: Glenn, O'Rourke, BSc(Hons) MBA, Deputy Captain Wollombi Brigade, New South Wales Rural Fire Service

A strategic and targeted approach to building resilience in the high bushfire (wildfire) risk community of Wollombi has generated remarkable results beyond that of research findings reported by the Australian Bushfire and Natural Hazards Cooperative Research Centre [BNHCRC] between 2009 and 2014.
Nestled in a rugged valley north west of Sydney, the small rural village of Wollombi is bordered on all sides by extensive eucalypt forest. The risk of bushfire is high, with major fires occurring in 1994, 2001, 2002 and 2004.

INSIGHT - community resilience insights arising from research.
A review of findings of BNHCRC research conducted to investigate community responses to bushfire threat over seven studies between 2009-2014 reveals generally low levels of risk perception, planning and preparation to survive bushfire. Findings provide a clear focus for 'engagement action', and recognition of shared responsibility required to improve bushfire survival.

ACTION - responding to what we have learned from the research.

In 2005, the volunteer Wollombi Rural Fire Brigade established the Wollombi Valley Bushfire Safety Program. Driven by constant measurement and community feedback the program has continued to innovate, developing a series of integrated risk based initiatives specifically targeted at closing the survival planning, preparation, decision-making gaps highlighted in the BNHCRC research.

RESILIENCE - building stronger community resilience and a better prepared community.

The Wollombi model of integrated risk based community engagement has not only achieved significant increases in community bushfire risk awareness [from 0% to 73%], preparation skills [from 34% to 94%], decision making [from 7% to 90%] and planning [from 9% to 95%], but has most significantly achieved measured tangible behavioural change in both the 'preparation for' [91% prepared/well prepared/very well prepared] and 'response to' bushfire [79% plan implementation] as evidenced by the findings of locally conducted research. Most significantly, 51% declare they have a written Bushfire Survival Plan compared 5.4% of people surveyed by the BNHCRC.

CONCLUSION

The Wollombi experience presents strong proof that a strategic and targeted approach to community bushfire safety works…. achieving tangible behavioural change and significantly improved community resilience. The Wollombi Rural Fire Brigade program is a leading example of a highly effective localised research based program driven by volunteers.

Keywords: Wildfire; Community Safety; Volunteer Program; Resilience; Survival Planning and Decision Making

Bio: Glenn is Deputy Captain and Community Safety Officer of the volunteer Wollombi Rural Fire Brigade, of the New South Wales Rural Fire Service, Australia. He holds the NSW RFS Commissioner's Commendation for Service.
Glenn commenced service as a volunteer over 30 years ago and is passionate about community bushfire safety. Over the past 10 years he has driven the development and implementation of what is regarded as cutting edge, best practice community engagement.
Professionally, Glenn is a strategist with an international construction company, and has a background in business strategy, change management and stakeholder communications.
Glenn holds a Bachelor of Science (Honours) and Master of Business Administration.

P24. Assessment of the Barriers to Wildland Firefighters' Fitness Training

Presenter: Aria Mangan, M.S. Candidate, Research Assistant, University of Montana

Additional Author(s):
Aria Mangan, Research Assistant, University of Montana
K. Ann Sondag, PhD. Project Director, University of Montana
Joseph Domitrovich, PhD. Exercise Physiologist, University of Montana and MTDC

Introduction: Working on a wildland fire can be physically and mentally taxing. Given the physical demands of the job, fitness is a key component in keeping wildland firefighters (WLFFs) healthy and safe from injury. Unfortunately little is known about physical training (PT) regimens of WLFFs.
Purpose: The purpose of this study was to examine motivators and barriers to PT in WLFFs. Personal, interpersonal, organizational and environmental factors that influence PT were identified. Strategies for overcoming barriers were recommended.
Methods: This study utilized a descriptive research design. Information about PT practices was collected through interviews with key informants (i.e. individuals in leadership positions who work directly with crew members). Interview data was analyzed qualitatively. Additionally, a questionnaire was developed, reviewed by experts, pilot tested and distributed electronically to WLFFs. Questionnaire data was entered in the SPSS statistical program. Barriers and motivators to engaging in PT among distinct categories such as agency type and crew type were examined for differences among the categories.
Results: Fourteen interviews were conducted with key informants from multiple state, federal and volunteer agencies. Two over-arching concepts emerged from interviews as major influences on PT. The first concept, firefighter culture, encompassed several themes. Themes included the powerful influence of leadership and the desire to be seen as a strong, capable and dependable crew member. The second concept, environment, included the influence of factors such as training facilities and equipment and the need for more holistic education about PT and health. Preliminary questionnaire results from nearly 1000 firefighters reveal the most frequently identified barrier to PT to be projects and work related trainings taking precedence over PT. Multiple motivating factors were identified including having a supervisor that participates in PT and wanting to be seen as a strong crew member.
Conclusions: This project was an attempt to gain an understanding of the current physical training practices of wildland firefighters. More importantly, results from this study identify, from the perspective of the firefighters themselves, the major motivators and barriers to engaging in quality, consistent physical training.

Keywords: Physical Training, Barriers, Motivators,Wildland Firefighters

Bio: Aria Mangan has a B.A. in Biology with a minor in Health and Human Performance. Aria is currently a Master of Science Candidate at the University of Montana studying Health and Human Performance with an emphasis in Community Health. Aria has six seasons of wildland fire experience working for the Forest Service in Region 4 and Region 1. Aria is currently working as a Research Assistant at the University of Montana.

P25. Polycyclic Aromatic Hydrocarbon Exposure from Prescribed Fire

Presenter: Kathleen Navarro

Additional Author(s):
John R. Balmes, Professor, University of California, San Francisco
S. Katharine Hammond, Professor, University of California, Berkeley

Background: Wildland firefighters work in high smoke exposure conditions with little to no respiratory protection. Wood smoke contains many hazardous air pollutants, including polycyclic aromatic hydrocarbons (PAHs). PAHs are known for their cancer-causing potential and have been associated with increased cancer risk of and immune system dysfunction. Past studies have demonstrated that open-air burning of wood generates more gas-phase PAHs such as naphthalene, phenanthrene, and fluorene than particulate-phase PAHs.

Objective: Gas-phase PAHs were measured during 5-day prescribed burn training. Air samples were collected during holding, firing, and mop-up at broadcast burns.

Methods: Personal PAH air samples were collected in duplicate using standard methods (actively-sampled XAD sorbent tubes) and analyzed for naphthalene, phenanthrene, acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, pyrene, and retene. Information on job task, smoke intensity and exposure duration was also recorded.

Results: Naphthalene (NAP) and phenanthrene (PHE) concentrations were highest while firing and holding (NAP= 2280 ug/m3; PHE = 160 ug/m3). Concentrations of naphthalene and phenanthrene were higher during firing (NAP=1480 ug/m3; PHE=110 ug/m3) compared to holding (NAP=760 ug/m3; PHE = 42 ug/m3). Concentrations of naphthalene and phenanthrene were lowest during mop-up (NAP=580 ug/m3; PHE=60 ug/m3).

Conclusion: The levels of naphthalene and phenanthrene measured in this study were significantly higher than those measured in previous studies. It is important to characterize exposures from wildland fires to better understand any potential long-term health effects.

Bio: Kathleen Navarro is currently a doctoral candidate in the Environmental Health Sciences division of the UC Berkeley School of Public Health, where she also completed her MPH degree in 2011. Her dissertation focuses on evaluating new tools and methodologies to measure and calculate exposures to hazardous air pollutants in occupational settings, such as wildland firefighting. She has a Bachelor of Science degree in Environmental Toxicology from UC Davis.

P26. Impact of a Flame Resistant Synthetic Material Base Layer on Heat Stress Factors

Presenter: Matthew Dorton, Masters Student, University of Montana

Additional Author(s):
Joseph Domitrovich PhD, Exercise Physiologist, Forest Service
Brent Ruby PhD, Professor, University of Montana
Charles Dumke PhD, Professor, University of Montana

Protective clothing worn by wildland firefighters (WLFF) may increase physiological strain and heat stress factors due to increased insulation and decreased ventilation. The effect of a flame resistant synthetic material base layer on heat stress factors

Bio: Matt Dorton is a graduating masters student at the University of Montana. His research interests include the physiological responses to exercise and the environment.

P27. Preliminary evaluation of factors affecting inhalation exposures among wildland firefighters

Presenter: Tim Reinhardt

Additional Author(s):
Tim Reinhardt, CIH Associate Scientist, Amec Foster Wheeler PLC
George Broyles, Fire & Fuels Project Leader, US Forest Service

Preliminary Evaluation of Factors Affecting Inhalation Exposures among Wildland Firefighters
In this paper, we present preliminary results of a statistical evaluation of various site, environmental and work activity factors on the shift- and fireline-average smoke exposures among wildland firefighters in the U.S. Inter and intra-crew variability to exposure and exposure metrics for fireline overhead personnel will be presented.

Wildland firefighters work in a dynamic environment and are exposed to a variety of hazards, including inhalation hazards from fire smoke, soil dust and powered equipment exhaust. Potential health effects include short-term conditions such as headaches, fatigue, nausea, and respiratory distress while long-term health effects may include an increased risk of cardiovascular disease.

The USFS under took a four year project to quantify exposure for wildland firefighters across the United States. Data was collected on wildland and prescribed fires in 17 states representing 11 of the 13 NFDRS fuel models. Exposure to carbon monoxide, respirable particulate matter (PM4) and crystalline silica (SiO2) were measured in the breathing zone of firefighters. Direct observation of firefighters was done in order to determine which variables are related to high exposure so that firefighters and fire managers can be better prepared to reduce these exposures. Measurements were also taken at incident base camps. During the four-year study, 7,517 hours of CO measurements on firefighters and 1,554 hours of CO measurements at ICPs and spike camps were taken.

Based on the findings there has been no appreciable reduction in firefighter smoke and dust exposure from levels that previous research had found. Exposure to wildland smoke has direct consequences on the ability of firefighters to remain safe by compromising their ability to think clearly and function at their highest mental and physical level. Exposure to the harmful constituents in wildland smoke must be addressed effectively in order to assure risk management decisions are sound.

Partial funding for this project is comes from JFSP Project Announcement No. FA-FON0013-0001, task statement 2; Health impairment from exposure to fire smoke: Relationships among the National Ambient Air Quality Standards (NAAQS) and industrial health guidelines.

Keywords: Inhalation irritants, carbon monoxide, silica, particulate matter, risk management, firefighter health and safety

Bio: Tim Reinhardt holds a BS in Environmental Science (Washington State University) and MS in Forest Resources (University of Washington) and has over 30 years' experience in air quality, human health risk assessment, and health, safety and environmental compliance. He worked as a wildland firefighter in 1978-79 with the USDA Forest Service, assisted emissions measurement research in the 1980s with the USDA-FS Pacific Northwest Research Station, lead research performing occupational exposure measurements among firefighters in the 1980s and 90s, and has been a Certified Industrial Hygienist since 1992.

P28. Rethinking the Fire Shelter

Presenter(s): Vincent H. Homer

Additional Author(s):
Carol Rice, Wildland resources, Consultant

A review of the statistics yields a questionable life safety record for shelter deployments in burn over and entrapment situations. USFS data indicates a wildland firefighter who deploys a fire shelter in true burnover conditions has a 4% chance of perishing, and a 50% chance of receiving 2nd degree or worse burns if s/he does survive. These statistics and concern over firefighter safety prompted an investigation into a new design from a perspective of thermodynamics and atmospheric survivability. We present data and concepts surrounding the thermodynamics of protecting humans from untenable temperatures, heat flux exposures and hot, toxic gases. Current Fire Shelters rely heavily on reflecting radiant energy from fires but do not provide sufficient protection against convective energy transfer. It is common in burn-over situations for shelters to experience direct contact with flames and high velocity, hot gases. We conducted high heat flux (~80 kw/m2) tests involving flame impingement on original and new generation fire shelter materials as well as heat resistant fabrics used in protective garments. These show that at 80 kw/m2 the inside surface of original fire shelter material reaches 75˚ C in less than 10 seconds. The New Generation, two-layer shelter performs marginally better. The only way to delay the temperature rise within the shelter is to provide insulation and/or heat sink capability. We present the design and test data on ways to delay heat rise, such that inside surface temperature can be held below 50˚C for up to 5 minutes.

The second major problem for the firefighter is maintaining a survivable atmosphere inside the shelter and exposure during repositioning during a deployment. We propose possible solutions for these problems.

It is obvious that adding insulation to the existing shelter configuration will increase the weight and bulk of the unit.

Lighter and less bulky alternative materials and methods of construction will be discussed to reduce this problem.

The talk is intended to inspire a fruitful discussion of the Fire Shelter program using test data and configuration suggestions to improve upon the current Fire Shelter design.

Keywords: Fire Shelter, Burnover survivability, breathable air, thermal burns

Bio: Vincent H. Homer, PE, CSP- My experience includes 40 years of fire related work in industry and government as a safety, fire protection and explosion mitigation engineer as well as a design engineer for an aerial fire fighting company. My most recent project was a fire fighting system to protect personnel in armored vehicle post IED fires. I have also been a wildland fire fighter as well as a volunteer fire fighter in both rural and industrial settings. My education includes a Associate degree in Mechanical Technology, BS in Aerospace Engineering and an MS in Engineering Management. I hold a PE (Mechanical) in three states and am a Certified Safety Professional.

P29. Fire and Debris Flows at the Boise Front

Presenter: Katherine T Gibble, MS Student, Boise State University Department of Geosciences

Additional Author(s):
Jennifer Pierce
Eric Lindquist

The foothills of the Boise Front are closely tied to the citizens that occupy them. Once dominated by sagebrush-steppe, human activity in and around Boise, Idaho has led to the invasion of non-native, flammable grasses. Paired with heightened flammability is continual growth of the Wildland Urban Interface (WUI) and, as a result, an increase in human-caused fire ignitions at the WUI. The cost and risk associated with extinguishing human ignitions and managing the resulting landscape raises the need to recognize patterns of ignition distribution, the unintended consequences they have on the landscape, and where this understanding fits into land management decision making. The risks arising from post-fire landscapes are often poorly understood. While it is known that fire increases erosion on burned watersheds, not all watersheds respond with hazardous post-fire debris flows. Currently, the areas at risk from post-fire erosion at the Boise Front are poorly defined. In fact, Boise has not undertaken a post-fire debris flow assessment, despite the risk inherit to its fire-prone, ignition-laden setting, which contains complex topography known to have produced post-fire erosion in the recent past. Presented here is the work being completed to assess fire-induced debris flows in the Boise Front. Recent work has attempted to quantify post-fire debris-flow probability and volume for the western US (Cannon et al., 2010). These models have been used to inform land managers of debris flow activity risks over several post-fire landscapes (USGS Landslide Hazards Program). Despite their utility, these models were produced using data from forest systems, excluding the influence that rangeland systems may have on the models. Here were present our work applying currently existing post-fire debris flow models over the Boise Front and, with the inclusion of ignitions, modifying these models to inform of hazards that may exist in the highly vulnerable rangeland WUI, and better characterize debris flow risks intrinsic to the geomorphically unique Boise Front for use by land managers and decision makers.

Keywords: post-fire debris flows, hazards, WUI, ignitions

Bio: Katie is pursuing a master's degree in geology at Boise State University. Her interests lie in fire-induced erosion and associated hazards, notably post-fire debris flows and flooding as well as the implications of these hazards on decision making.

P30. Modeling Potential Fire Behavior Changes Due to Fuel Breaks in the Monterey Ranger District, Los Padres National Forest, California

Presenter: Stacy Drury, PhD, Senior Fire Ecologist, Sonoma Technology Inc.

The Monterey Ranger District (MRD) of the Los Padres National Forest and its partner, FireScape Monterey, are proposing to re-establish and maintain a set of fuel breaks around the Ventana Wilderness. The proposed fuel breaks are intended to 1) increase fire suppression efficiency, 2) reduce wildfire risk to life and property near the MRD and surrounding communities, 3) reduce wildfire suppression costs, and 4) reduce adverse fire suppression impacts. I used the fire behavior modeling tools in the Interagency Fuels Treatment Decision Support System (IFTDSS) to analyze

whether the fuel breaks would increase wildland fire suppression efficiency and reduce wildfire risk to life and property. The project objectives were to a) identify if large fires would occur within the Ventana Wilderness and move into the surrounding wildland-urban interface (WUI), b) identify whether the fuel breaks are strategically located where they will be encountered by wildfire, and c) identify the potential for the fuel breaks to mitigate fire movement into the communities of Big Sur, Palo Colorado, and Cachugua.

I used a multi step process to bring historical fire occurrence, historical fire weather patterns, and fuel model assessments into a fire behavior modeling framework. I modeled potential fire behavior and fire growth across spatial landscapes with and without the proposed fuel breaks simulated in the landscape. Baseline conclusions support preparing and maintaining the fuel breaks. The modeling shows that fuel breaks are strategically placed in locations that have historically burned during wildfires and/or have provided opportunities for fire suppression activities, such as back burning. Alone, and in conjunction with fire suppression actions, the fuel breaks can lower flame lengths and mitigate fire movement, meeting the objectives of the MRD. The lowered flame lengths and decreased rates of spread can provide opportunities for firefighters to use alternative strategies for suppressing fire. Pre positioned fuel breaks can serve as anchor points for creating additional fuel breaks as needed or provide safe areas for igniting back burning operations.

Keywords: Fuels Treatment planning, Fuels Treatment evaluations, Fire Behavior Modeling

Bio: At STI, Stacy provides scientific oversight and technical guidance on fire and fuels research and software development. He conducts research on fuel loading, fire occurrence, fire behavior, fuel consumption, and fire effects. Much of Stacy's research is centered on modeling wildfire hazard and risk – in particular, how fuels treatments mitigate fire hazard and risk to natural resources and communities. He has assessed fuels treatment effectiveness using satellite imagery, modeled fuel loading changes due to fuels treatments, and modeled potential fire behavior and fire effects in the Wildland Urban Interface.

P31. Fuel Treatment Research and Technology Transfer – How to Better Support Practitioners' Needs

Presenter(s): Thomas Zimmerman. Ph.D. Senior Wildland Fire Consultant, Tom Zimmerman Consulting.

Additional Author(s):
Richard Lasko. Natural Resource Consultant. US Forest Service retired
Merrill Kaufmann. Emeritus Scientist, Rocky Mountain Research Station

Significant changes occurring in the wildland fire environment of the United States are generating uncharacteristic shifts in the complexity, behavior, extent, and effects of wildfires. Treatment of wildland fuels to mitigate the risk of severe wildland fire impacts to human communities and valuable natural and cultural resources, and maintain and improve the health and resiliency of forest and rangeland ecosystems is emerging as a keystone land management process. With fuel treatment activities receiving greater attention and scrutiny, it is imperative to find ways to improve overall fuel treatment program effectiveness. The foundation for successfully meeting this challenge is research that addresses pertinent issues and provides actionable information to support management practices. Although much work has been done on this subject, there is a need to provide better guidance to research and development to address high priority knowledge and technology needs. Many questions remain at the center of both management and policy. We conducted a one-year study, supported by the Joint Fire Science Program (JFSP), that surveyed a large number of individuals across the United States from areas including, but not limited to fire and fuels management, research, education, technology transfer, program management, decision-making, and program leadership. From these individuals we gathered fuel treatment research needs; explored the progress of the scientific community in meeting these information needs; examined technology transfer venues that link practitioners to scientific information; and assessed program reference materials, management tools, and other supporting information. From this information, we identified potential areas of future fuel treatment research and possible venues for improving technology transfer.

Keywords: fuel treatment, science, fire management, wildfire, fire risk, technology transfer

Bio: Thomas Zimmerman is senior wildland fire management consultant. He served for 35 years in wildland fire management with the Bureau of Land Management, National Park Service, and US Forest Service in various capacities at all organizational levels. He has worked in areas of fire ecology, fire suppression, prescribed fire, wildland fire use, fire behavior, smoke management, incident management, emergency response, technology transfer, training, national fire policy development and implementation, fire reviews and accident assessments, decision making, risk assessment, and change management. He is a certified Senior Fire Ecologist and Senior Wildland Fire Manager by the Association of Fire Ecology.

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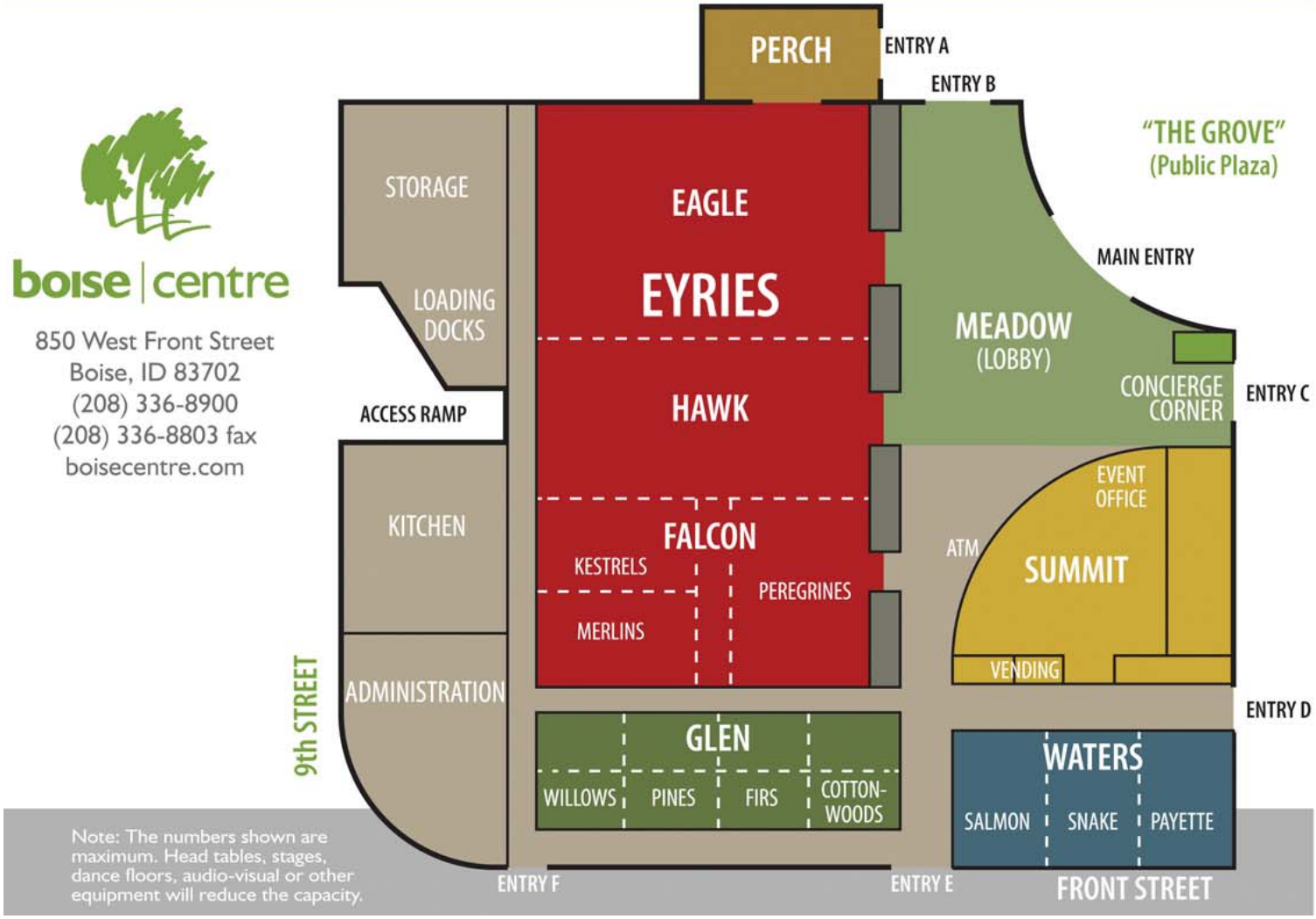

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