National Cohesive Wildland Fire Management Strategy Workshop
All Hands, All Lands: Implementation Rooted in Science

Peppermill Resort Spa Casino - Reno, Nevada
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Oral Presentation Abstracts

1. Connecting to Underserved Communities who are at Risk from Wildfires: Formal Agreement with The Center for Heirs Property Preservation.
Presenter: Brian Schaffler, Forest Fire Management Officer, US Forest Service

A combination of landscape, historical, and socio-cultural factors make the area a unique, challenging, and exciting place in which to address fire. Much of the land area in Charleston County, South Carolina is classified as Wildland-Urban Interface (WUI) and is characterized by high wildfire risk. It is also unique because it lies in the Gullah Geechee Cultural Heritage Corridor, a coastal zone populated by many people of Gullah Geechee descent. In addition, a significant portion of the land in this area is considered heirs property (HP). Heirs property is mostly rural land owned by African Americans who either purchased or were deeded land after the Civil War. By definition, HP is property for which there is no legal will designating the rightful owners, and even long-time residents descended from the original property owners face the risk of losing property which they may believe is legally theirs. Additionally, much of the Heirs property is in high wildfire risk areas. FireWise activities and other mitigation activities are limited or do not exist in these areas.

Working in collaboration with The Center for Heirs Property Preservation (CHPP), the Francis Marion-Sumter National Forest have executed a Participating Agreement to specifically concentrate on addressing wildfire mitigation actions to Heirs Properties and underserved communities. The formal partnership between the Forest and CHPP will seek to outreach to local residents, facilitate local workshops to educate landowners on local fire ecology, the importance of prescribed fire to the area, and more importantly address the public safety hazards associated with wildfires common to the areas. A Community Wildfire Protection Plan was recently created covering numerous Heirs properties. The CWPP contains a state of the art wildfire risk assessment merging County-wide spatial data with the powerful SouthWRAP tool, providing detailed analysis of wildfire susceptibility, burn probability, and other outputs on all lands and structures (building footprints). With this data, workshops will identify Heirs properties that need fuels mitigation work creating opportunity for the Forest to enter into Wyden Agreements with willing landowners so as to assist them in fuel treatment activities.

Keywords: Connecting Underserved Communities and Wildfire Risk

Bio: Brian Schaffler is currently the Forest Fire Management Officer of the Francis Marion & Sumter National Forests in South Carolina. He has nearly 28 years of fire experience working

for the United States Forest Service, the Bureau of Land Management, the US Fish and Wildlife Service, and Volunteer Fire/Rescue Departments. His passion lies in developing strong partnerships focused on fire mitigation projects in areas of high wildfire risk. This includes developing Community Wildfire Protection Plans that concentrate on cross-boundary hazardous fuels treatments in densely populated Wildland Urban Interface environments.

2. What Can We Learn From Homeowner Associations In Promoting Household Wildfire Mitigation?

Presenter: Eric Steffey, Lecturer, San Francisco State University

Co-Co-Author(s):
Megha Budruk, Ph.D., Associate Professor, Arizona State University
Christine Vogt, Ph.D., Professor, Arizona State University

In recent decades, homeowner associations (HOA) have become a growing preference in home purchases across the United States. These private governments provide opportunities for more localized control of the neighborhood beyond what is offered by municipal government services. With increasing development in the Wildland Urban Interface (WUI), which includes neighborhoods with HOAs, and ever increasing wildfire threats, it is important to understand how municipalities can work to minimize wildfires impact on their community. Literature has identified HOAs as promoting homeowners to take mitigation actions through a number of different regulations, norms, and programs. Studying HOAs in a wildfire mitigation context could present strategies for greater community safety by informing municipal programs and policy. This paper reports on a study conducted during the fall of 2016 exploring homeowner mitigation behaviors at the WUI in Prescott, Arizona. The study implemented a self administered questionnaire sent via standard survey mail methods to reach participants. Results show that HOAs provide a significant impact on homeowners perceptions and actions. Perception of wildfire risk, personal responsibility, subjective knowledge of wildfire, and mitigation of propertys vegetation were significantly higher among HOA residents when compared to non-HOA residents in the region studied. Participants highlighted many elements of how HOAs help to promote wildfire mitigation in their neighborhoods. Applying these strategies to municipal programs and policy could develop more encompassing community wildfire mitigation participation. With a goal of promoting a more fire adapted community, recommendations and implications of these results are discussed.

Keywords: Wildfire Mitigation, Homeowner, Association, HOA

Bio: Eric Steffey recently completed his PhD at Arizona State University in the School of Community Resources and Development and is currently a Lecturer at San Francisco State University. He has a Bachelor and Master degree from Michigan State University where he studied natural, cultural, and recreation resource management. Eric has been involved in a broad range of research and conducted many projects from park visitor use surveys to community needs assessments. His field experiences include working at Sleeping Bear Dunes National Lakeshore and the Florida Park Service. While employed by the Florida Park Service,

Eric was involved with many aspects of the park and its operation. In addition, he was an active Wildland Firefighter participating in Rx burns, wildfires suppression actions, education programs, and outreach. Erics experience with wildland fire continues to spur his interests today. His current research interests are focused on understanding homeowner wildfire mitigation behaviors and the roles homeowner associations have in promoting action.

3. Community Stewardship Through Neighborhood Engagement
Presenter: Pam Wilson, Executive Director, FireWise of Southwest Colorado

As wildfires continue to grow in size and complexity, with more acres burned and more homes lost, it is imperative to have greater involvement by citizens in addressing common resource management concerns in the community-public land interface.

FireWise of Southwest Colorados unique Neighborhood Ambassador Program was started in 2004 based on a study called People and Fire in Western Colorado written by Sam Burns (Ft. Lewis College), Rod Hodgson (BLM) and Chuck Sperry (Center for Economic Democracy). The study focused on the basic principle that people, communities, and the surrounding landscapes need to be connected if they are to be mutually sustainable.

The form or type of stewardship can vary from public participation, to civic engagement, collaborative learning, community development, alternative conflict resolution, community action, or action research; however, the fundamental intent is to build new forms of problem-solving relationships whereby community members engage authentically with natural resources issues and goals.

Our program connects neighbors to neighbors, neighbors to their communities, and neighbors to their surrounding landscapes, which in southwest Colorado is more often than not, public lands. It builds capacity for wildfire mitigation within communities and on public lands, ultimately building sustainability and long-term stewardship.

FireWise supports communities in efforts to develop community based Community Wildfire Protection Plans or Community Assessments to help them get started with their mitigation efforts. Over the past 13 years, through ongoing engagement, workshops, and incentive programs we have built a model for engaging residents in wildfire mitigation, preparedness, and forest health. We will demonstrate how ongoing engagement with neighborhoods can improve a regions ability to successfully create fire adapted communities and implement all the goals of the National Cohesive Strategy.

Keywords: Community Engagement, Fire Adapted Communities

Bio: Pam Wilson has served as the Director of FireWise of Southwest Colorado since Oct. 2008 and is a founding member of Fire Adapted Colorado, a statewide network, on which she has served as chairperson since its inception in Aug. 2016. In 2014, FireWise joined the Fire Adapted Communities Learning Network.

Pam retired from the U.S. Forest Service in 2007 after 23 years of service, most recently as a Public Affairs Specialist for the fire and fuels program. She is a Type 1 Public Information Officer and has worked wildfire and hurricane assignments throughout the U.S.

4. Living with Fire in Valley County
Presenter: Stephanie Nelson, Principle Owner, Wildfire Prevention Associates

One Size Does Not Fit All. Meeting the challenge of fixing a broken system of failed collaboration means taking a hard look at why everyone walked away from the table and determine what it takes to bring them back. With ten years on the books Valley County's Fire Working Group is still full steam ahead. Convincing agencies to reallocate staff after a crisis of confidence in 2006, required a unique and very local approach. The end game was to achieve fire adapted communities and landscapes.

The process was to engage the many local natural resource and fire professionals and ask them to bring everything back to the table. It began with a plan to organize the system to reflect local needs and assist the group with visioning for a successful and indeed, collaborative approach to problem solving. Local is a big part of the success story. Asking good people to give their opinion is key. Utilizing national cohesive strategy information and data is very important, but it is only the first step: How did this information on achieving fire adapted communities relate to what was happening in Valley County; What would help this group actualize their goal to deliver a message to the entire community and particularly to landowners living at risk in the Wildland Urban Interface; Most important, what tasks would be worthy of each persons effort.

Key elements became apparent: How to use the talent sitting in the room; How to create an environment that encouraged opinion, disagreement and resolution; How to reach a community busy enjoying second homes and recreation; How to educate and support planning & zoning staff and regulators in a burgeoning development area; How to understand and protect a seasonally transient community. One more need after another continues to rise through the process of collaborating as a group of committed stakeholders.
Why not just hand out literature from a national source and move on? Because, as referenced above, One Size Does Not Fit All. The end result is a local solution to a national concern.

Keywords: Collaboration, Community Leaders, Common Message

Bio: Stephanie Nelson, Wildfire Prevention Associates. With a degree in Economics from California Polytechnic State University, San Luis Obispo, Stephanie began her career in the oil industry managing bunker fuel sales at the Port of Long Beach. After several years in the Santa Barbara area managing corporate incentive programs Idaho became home. In 1998 she began working for Boise Cascade in the Forestry Division, eventually managing the GIS program for the Idaho Lands. In 2006 she supervised her first hazard fuels treatment project in the Bear Basin area. Over the past ten years she has worked with Valley County to create a paradigm

shift for landowners living with wildfire. She has successfully secured funding for numerous landscape scale restoration projects and is the Facilitator for the Valley County Fire Working Group.

5. Are U.S. Federal Fire Management Systems Resilient?

Presenter: Christopher Dunn, Research Associate, College of Forestry, Oregon State University

Co-Author(s):
Matthew P. Thompson, Rocky Mountain Research Station, US Forest Service, Missoula, MT
David E. Calkin, Rocky Mountain Research Station, US Forest Service, Missoula, MT

Problems of fire management, forest health, and community protection are increasingly viewed through the lens of social-ecological systems (SES). The National Cohesive Wildland Fire Management Strategy has captured this perspective with its three stated goals: resilient landscapes, fire-adapted communities and safe and effective wildfire response. We argue that new paradigms in fire management will be necessary to achieve these goals given significant limitations to implementing hazardous fuels reduction programs. A key theme of SES design and evaluation is the notion of resiliency and questions remain about the resiliency of the fire management system itself. Like the notion of sustainability, resiliency has been defined in different ways, by different entities, for different purposes. Resultantly, the question of œis the fire management system resilient can be answered, with equal credibility, in both the affirmative and in the negative. In this presentation we will first discuss U.S. federal wildland fire management, and argue that behavior over time suggests an engineering approach to resilience where minimizing disturbance through fire exclusion and maintaining constancy and stability were the foci. System behavior has largely been persistent and resistant to change, resulting in some cases in unintended feedbacks that render minimizing disturbance increasingly difficult, and leading to a likely trajectory of increasing costs and losses. Against the backdrop of a dramatically changed, and ever-changing, fire environment, we argue that an SES approach to resilience focusing on transformability and adaptability is more appropriate today. We introduce possible near- and long-term changes in system structure that might yield benefits, and discuss how principles of risk and decision analysis can help set the stage for transformation and adaptation.

Keywords: fire management system; systems perspective; social-ecological systems

Bio: Chris Dunn is a Research Associate in the College of Forestry at Oregon State University. His scientific research has largely focused on fire ecology and post-fire effects, but he has recently transitioned back to his fire suppression and management background and is now investigating large wildfire management safety and effectiveness with the Human Dimensions Program at the Rocky Mountain Research Station in Missoula, Montana.

6. Idahos Good Neighbor Authority Leadership

Presenter: Peg Polichio, Idaho Good Neighbor Authority Facilitator, Idaho Department of Lands

Co-Author(s):
Jon Songster, Federal Lands Program Manager, Idaho Department of Lands

After more than a decade of temporary authority, the 2014 Farm Bill expanded the Good Neighbor Authority (GNA) to authorize all states to enter into unique partnerships with the U.S. Forest Service and Bureau of Land Management. This authority provides agencies a new tool to work across jurisdictional boundaries to treat landscapes in a mixed ownership setting. GNA is enabling the Idaho Department of Lands to leverage its land management expertise to collaboratively increase the pace and scale of forest and watershed restoration activities on National Forests in Idaho. These cooperative efforts can improve forest health and reduce threats to communities and watersheds from catastrophic wildfires while creating jobs and supporting local economies. This presentation will provide an overview of the Good Neighbor Authority, the keys to early success, and the lessons learned in Idaho.

Keywords: restoration good neighbor authority idaho farm bill

Bio: Peg Polichio is under contract to the Idaho Department of Lands to serve as the Idaho Good Neighbor Authority Facilitator. She is the President of Forest Insight LLC, an Idaho based forest policy business. Peg is a retired Forest Service veteran of 37 years. She served in numerous forestry and fire technical and leadership positions throughout the Intermountain West. She retired from Portland, Oregon, as the Director of State and Private Forestry for the Pacific Northwest and Alaska Regions (R6 & R10) of the Forest Service in 2014.

7. East Face Elkhorn Mountains – Applying the Cohesive Wildfire Strategy in Northeast Oregon

Presenter: Bill Gamble, District Ranger, USDA Forest Service and Mark Jacques, Coordinator, Northern Blue Mountain Cohesive Wildfire Strategy Project, Oregon Department of Forestry, LaGrande, OR

The restoration need of intermountain west forests is both compelling and daunting. The magnitude of forest restoration needs can challenge land managers ability to effectively focus limited resources in areas of greatest restoration need and benefit. Land management partners in northeast (NE) Oregon are utilizing a variety of scientific tools to assist with strategic planning prioritization across the Blue Mountains including landscape scale fire risk assessments and new prioritization approaches for restoration projects using optimization and the framework of production possibility frontiers techniques developed by Forest Service research scientists. These tools are helping land managers identify priority areas to apply restoration actions and evaluate associated social, economic and ecological benefits and trade-offs. Coupled with current restoration initiatives such as the Joint Chiefs Restoration Partnership, land managers in NE Oregon used these tools in the development and implementation of the East Face of the Elkhorn Mountains project that embodies the

underlying Cohesive Wildfire Strategy objectives to increase landscape resiliency and promote fire adapted communities. This presentation will share how current science and policy initiatives have aligned and are being used to promote and implement all lands/all hands efforts along the east face of the Elkhorn Mountains in northeastern Oregon.

Keywords: Landscape assessment and prioritization, collaboration, Joint Chief's Restoration Partnership

Bio: Bill Gamble, District Ranger, USDA Forest Service, Wallowa-Whitman National Forest
Bill has 25+ years of experience engaging in natural resource management in the western United States including roles as a silviculturist, hydrologist, NEPA planner, team leader and line officer with the Forest Service in Oregon, Idaho and Nevada. Bill currently serves as your district ranger in La Grande, Oregon on the Wallowa-Whitman National Forest and has been actively fostering local collaboration aimed at increasing the pace and scale of restoration in the Northern Blue Mountain forests and applying Cohesive Wildfire Strategy (CWS) principles as part of a national pilot program in NE Oregon and SE Washington.

Mark Jacques (pronounced as Jakes) - Coordinator, Northern Blue Mountain Cohesive Wildfire Strategy Project, Oregon Department of Forestry, La Grande, OR
Mark retired in 2012 from a 36 year career in natural resource and wildland fire management with the Oregon Department of Forestry. A majority of that time was spent in NE Oregon in various forestry and wildland fire positions. In 2013, Mark became the part-time coordinator of the Northern Blue Mountain Cohesive Wildfire Strategy Pilot Project. This project is aimed at the field implementation of the Cohesive Strategy in NE Oregon and SE Washington.

8. Washoe County's Smoke Management Outreach Program
Presenter: Julie Hunter, Senior Air Quality Specialist, Washoe County Air Quality Management Division

Here in Washoe County, Nevada we have an extensive outreach program, a solid Smoke Management Program, and are collaborating with our local fire protection agency on strengthening our open burn program. In 2014, EPA recognized our Keep it Clean outreach program with the Gregg Cooke Visionary Program award.
A campaign within our Keep it Clean outreach program is Be Smoke Smart. This campaign was developed in 2015 and designed to provide near time information on fires, smoke impacts, AQI levels, and precautions. Be Smoke Smart is used in conjunction with social media to deliver the information the community needs to make good decisions about outdoor activities. Another campaign within Keep it Clean is Know the Code. This is our wintertime burn code outreach program that informs the public if they can burn in their wood stoves. Know the Code is also used by land managers in their decisions to conduct prescribed fires.

Keywords: Wildfire, prescribed fire, outreach, land managers

Bio: Julie Hunter is a Senior Air Quality Specialist with the Washoe County Health District. As a member of the Air Quality Management Division Planning Section, Julie is the Smoke Management Program coordinator, lead for Exceptional Events, has co-developed an Idle Free program for Washoe County Schools, and also works as the project manager for the outreach program. Julie received her Bachelors and Masters degrees in Environmental Science and Health at the University of Nevada, Reno and has worked in the environmental field since 1996. Julie has experience in Microbial Ecology, Toxicology, Industrial Hygiene, Environmental Health, and Air Quality.

9. Treatment Optimization of Restoration Values Incorporating Economic Trade-Offs

Presenter: Amy Waltz, Director of Science Delivery, Ecological Restoration Institute, Northern Arizona University

Co-Author(s):
Kevin Vogler, Research Analyst, Oregon State University
Alan Ager, Operations Research Analyst, Rocky Mountain Research Station
Mark Nigrelli, GIS Analyst, USFS Coconino National Forest

The National Strategy for the Cohesive Wildland Fire Management specifies a vision and management options to meet goals of managing and mitigating for, and living with fire-adapted landscapes. The strategy suggests implementation should include prioritization through strategic assessments of the trade-offs among different management scenarios and their impact on the broader landscape. Of particular value is the capability of these tools to conduct economic analyses to show the trade-offs between socioeconomic and ecological goals associated with large-scale forest restoration investments. We present an optimization analysis on a million acre planning area within the 4 Forest Restoration Initiative landscape (northern Arizona) to assess implementation scenarios to meet restoration goals with economic cost/benefit trade-offs. We used the Landscape Treatment Designer (Ager et al 2012) to demonstrate an optimization approach for restoration projects that utilizes production possibility frontiers to assess economic costs and benefits. We incorporated the project analysis from the signed Forest Service decision, and addition methodology to better estimate the economics associated with restoration activities. The economic information and the trade-off analyses have not been available to this project and partners, and thus decisions about restoration priorities were not informed by the complete picture of the financial cost to emphasize one restoration objective versus another. We demonstrated optimal project locations in order to meet forest restoration and economic objectives, and the potential cumulative attainment of restoration goals based on various sequencing scenarios. The broad goal of the analyses was to inform Forest Service implementers and stakeholders about the possible choices in terms of restoration accomplishments; specific goals were to identify areas of overlap for restoration goals and economic feasibility, and the areas where subsidies or other innovations may be necessary to accomplish the ecological goals. Future work will inform across-boundary priorities, incorporated the treatment sequencing on USFS lands.

Keywords: forest restoration; multiple value trade-off; treatment optimization;

Bio: Amy is a research ecologist with a background in ecological restoration. She has a PhD from Northern Arizona University in Biology and taught introduction biology and conservation biology at Pacific University in Forest Grove, OR. Amy has worked in Bend, Oregon, cost-shared for The Nature Conservancy and Deschutes National Forest coordinating a collaborative that is now the Deschutes Forest Collaborative. Her current position is the Director of Science Delivery with the Ecological Restoration Institute at Northern Arizona University. In this position she works to translate and deliver peer-reviewed science relevant to landscape-scale ecological restoration to land managers and multi-stakeholder groups.

10. Nationally Consistent Non-Forest Fuelbed Maps for Improved Decision Support Outcomes

Presenter: Christopher O'Connor, Research Ecologist, US Forest Service, Rocky Mountain Research Station

Every manager knows that grasses and shrubs grow more in wet years, and less in dry years. These responses to climate manifest themselves in surface fuels and the inter-annual variability often exceeds 100%, especially where invasive annual grasses are present. This seasonal/annual climate response in fuel loads substantially alters fire behavior as well as associated smoke emissions, with profound implications for firefighter safety, fuel treatment effectiveness, and air quality throughout much of the country. Yet, current fuel mapping processes, such as LANDFIRE, are unresponsive to these annual or seasonal fuel changes. The inability to incorporate the inter-annual weather response of rangeland fuel loads into decisions support systems significantly limits the effectiveness of numerous efforts critical to core agency goals. Thus, decision support systems are operating with inaccurate fuels data. Managers often spend a considerable amount of time making adjustments to these fuels to get suitable outcomes from fire models. A recent analysis of 9,780 incidents entered in the Wildland Fire Decision Support System (WFDSS) revealed that more than 50% of all changes made to existing fuel maps were within non-forest fuel types such as those addressed by this project. The disconnect between high inter-annual variation and existing fuel data creates confusion, decreases the efficacy of decision support systems, and reduces the likelihood of positive outcomes. This begs the question why arent we using better fuel data products?
In this pioneering project we offer a solution to this problem by developing a new generation of fuel maps from 2000 to 2017 and account for the significant inter-annual variability in rangelands fuels. The resulting product is consistent and seamless across the coterminous US at 30 m resolution and yields surface fire behavior fuel model data as well as actual loadings of 1, 10, 100 and 1000 - hr. time lag fuel size categories for both woody and herbaceous fuels. In this presentation we discuss the significant need for more timely and accurate data and demonstrate potential cost savings and increased efficacy achieved through adoption of these new fuel data throughout our decision support systems.

Keywords: Rangeland, Fuel, Inter-annual Variability, Fire behavior, decision support system

Bio: Matt Reeves is a Research Ecologist with the Rocky Mountain Research Station in Missoula, MT where he specializes in applying remote sensing and modeling to characterize ecological dynamics of rangelands. His research follows four basic themes including climate change, vegetation and fuel dynamics, anthropogenic disturbance, and decision support tools, such as digital state & transition simulation models, for improving management efficacy.

11. Spatial Wildfire History: New Jerseys Hidden Resource
Presenter: Inga La Puma, Science Communication Director, North Atlantic Fire Science Exchange

New Jerseys pinelands are not well known nationally as an area where wildfire regularly occurs. However, it is a highly volatile ecosystem in the most densely populated state in the U.S. The pinelands provide a preview of issues arising in similar areas under increasing population pressures and highlight the need for appropriate scientific tools to address WUI challenges. This talk will cover the creation of a 90-year spatial wildfire history database of the pinelands, and will include maps of areas with the highest wildfire frequency as well as areas with the longest fire free time periods and potential fuel buildup. The usefulness of maintaining or initiating a spatial fire history for any jurisdiction will be emphasized, and direct applications of this type of spatial data will be highlighted. These include landscape level planning, community level wildfire risk-reduction, wildfire response prioritization, and habitat restoration.

Keywords: wildfire, WUI, GIS, spatial, history, risk

Bio: As science communications director for the North Atlantic Fire Science Exchange Inga uses newsletters, research briefs and website materials to help facilitate relevant wildfire research and promote access to meaningful fire science. She is a spatial ecologist focused on how disturbances shape the trajectories of forest succession. Ingas research in the past has spanned from leaf-level to landscape level, and from invasive exotic species to remote sensing and carbon flux measurements of tundra. She has a Ph.D. in Ecology from Rutgers where she focused on wildfire, climate and land-use in the Pinelands of New Jersey.

12. Historical Fire-Climate Patterns in California
Presenter: Jon Keeley, Research Ecologist, U.S. Geological Survey

Co-Author(s):
Marti Witter, Fire Ecologist, Santa Monica Mountains National Recreation Area/ Channel Islands National Park/ Cabrillo National Monument

Based on roughly a century of data, there are five important lessons on fire — climate relationships in California 1) Seasonal variations in temperature appear to have had minimal control on area burned in the lower elevation mostly non-forested landscapes. 2) Temperature has been a significant factor in controlling fire activity in higher elevation montane forests, however, it varied greatly with season; winter and autumn temperatures showed no significant effect, whereas spring and summer temperatures were important determinants of area

burned. 3) Current season precipitation has been a strong controller of fire activity in forests, with drier years resulting in greater area burned on most USFS lands in the state, but the effect of current year precipitation was decidedly less on lower elevation Cal Fire lands. 4) In largely grass-dominated foothills and valleys the magnitude of prior year rainfall was positively tied to area burned in the following year, and we hypothesize that this is tied to greater fuel volume in the year following high rainfall. In the southern part of the state this effect has become stronger in recent decades and this likely is due to accelerated type conversion from shrubland to grassland in the latter part of the 20th century. 5) The strongest fire — climate models were on USFS lands in the Sierra Nevada Mountains, and these explained 42 – 52% of the variation in area burned, however the models changed over time with winter and spring precipitation being the primary drivers in the first half of the 20th century, but replaced by spring and summer temperatures after 1960.

Bio: Jon E. Keeley, is an ST scientist with U.S. Geological Survey, Western Ecological Research Center, adjunct professor at UCLA, former program director at NSF, recipient of a Guggenheim Fellowship and is an Ecological Society of America Fellow. Dr. Keeley has over 350 publications in national and international scientific journals and books. His diverse research interests include fire ecology, seed germination, vernal pool physiology and biochemical pathways of photosynthesis. He has spent sabbaticals in all five mediterranean climate regions of the world and is senior author of a 2012 Cambridge University Press book Fire in Mediterranean Climate Ecosystems: Ecology, Evolution and Management.

13. Opening a Policy Window or a Non-Event: Does Experience with Wildfire Lead to Local Government Adaptation?

Presenter: Miranda Mockrin, Research Scientist, USDA Forest Service, Northern Research Station

Co-Author(s):
Hillary K. Fishler
Susan I. Stewart

Becoming a fire-adapted community that can live with wildfire is envisioned as a continuous, iterative process of adaptation. In nine case study sites across the United States we examined how destructive wildfire affected altered progress towards becoming fire-adapted, focusing on the role of WUI regulations (building codes, hazard mitigation standards, zoning, and other local governmental tools used to reduce exposure to wildfire losses). Experience with wildfire and other natural hazards suggests that disasters may open a window of opportunity leading to local government policy changes. However, we found mixed results in our study: for some communities, the fire was a focusing event that led to changes in WUI regulations (for example, modifying building codes). In other communities, destructive fire did not spur adaptation through changes in governmental policy. In some communities, local government officials thought current policies were effective and factors beyond their control such as extreme weather were to blame for structure losses. In other cases, wildfire losses were accepted as a risk of living on the landscape, considered an isolated incident that affected few

or was unlikely to be repeated, or enacting regulations was seen as incompatible with local norms and government capacity, We conclude that adaptation to wildfire through WUI regulations depends on multiple factors, including past experience with fire and the geographic extent and scale of the fire event relative to the local community and its government. While communities did not often pursue changes in WUI regulations, experience with wildfire was frequently cited as the impetus for other adaptive responses, such as improving emergency response or fire suppression, and expanding education and interaction with homeowners, such as Firewise programs or government support for fuel mitigation on private lands.

Keywords: WUI, recovery, regulations, fire-adapted communities

Bio: Miranda Mockrin is a Forest Service Research Scientist who studies conservation and land use, combining ecological and social science. Current research at the Northern Research Station focuses on understanding changing natural resource use and management with shifting human demographics, including examining mapping the growth of the wildland-urban interface (WUI) over time, examining rebuilding in the WUI after wildfire, studying housing development and its ecological and social effects, and exploring alternative forms of development such as conservation development.

14. Communities at Risk from Wildfire in the Western US: Comparing Preparation for and Impacts from Wildfire in a Large Cross-Section of Communities

Presenter: Max Nielsen-Pincus, Assistant Professor, Portland State University

Co-Author(s):
Alan Ager
Cody Evers

Increasingly, human decisions about where to live intersect with ecological processes like wildfire, straining government capacity to protect homes and other infrastructure while simultaneously increasing the need for effective planning to mitigate wildfire risks. Policies and programs worldwide have responded to wildfire risk with coordinated approaches to planning and implementing community wildfire risk mitigation that crosses ownership and management boundaries. Although this problem is recognized at multiple levels of governance, communities are often on the front lines of planning and coordination of wildfire risk reduction projects in the wildland urban interface. However, a robust understanding of the limitations communities face for effectively implementing the all lands, all hands approach is lacking. We surveyed over 300 key informants for communities in Arizona, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, and Washington. Key informants reported on (1) their communitys network of wildfire risk managers, (2) recent experiences with wildfire and its impacts, (3) wildfire preparedness and barriers to being prepared, and (4) local capacity to address wildfire risks. Our survey results provide a snapshot of wildfire preparedness and impacts to communities across the western US that is largely uncharacterized at scales greater than an individual community case studies. The results show that many community leaders

indicate their communities are unprepared despite having adopted many strategies to address wildfire risks, and that the impacts of hazardous wildfires can persist for multiple years. We argue that the collection of generalizable community-scale data could offer policy makers at a variety of governance levels (e.g., federal, state, regional) an emerging scientific approach to (1) better target appropriate resources to communities that are capable of collectively acting on the all lands, all hands vision of the Cohesive Strategy and (2) identify communities that would benefit from building the capacity to adopt this type of approach.

Keywords: Cohesive Strategy, community impacts, key informant survey, risk mitigation

Bio: Dr. Nielsen-Pincus is an assistant professor of environmental science and management at Portland State Universitys School of the Environment. His research on social-ecological systems includes a focus on wildfire social science. He has contributed to and led research related to community risk mapping, community-based wildfire risk mitigation planning, landowner decisions about fuels management, 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, including a field course on wildfire ecology and management.

15. The Marin Community Wildfire Protection Plan " Science-Based Collaborative Planning and Implementation

Presenter: Tami Lavezzo, Sonoma Technology, Inc.

Co-Author(s):
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Wildfires pose the greatest risk to human life and property in Marin Countys densely populated wildland urban interface (WUI), which holds an estimated 69,000 living units. Marin County is home to 23 communities listed on the California Department of Forestry and Fire Protections (CAL FIRE) Communities at Risk list, with approximately 80% of the total land area in the county designated as having moderate-to-very-high fire hazard severity ratings. This is further complicated by the fact that national fire suppression policies and practices have contributed to the continuous growth (and overgrowth) of vegetation, resulting in dangerous fuel loads. The county has a long fire history and has experienced many large wildfires over the past decades, several of which have occurred in the WUI.
In response to these concerns, FIRESafe MARIN and the Marin County Fire Department led an effort to update and expand the Marin County Community Wildfire Protection Plan (CWPP). The purpose of a CWPP is to mitigate the risk of wildfires to communities, watersheds, infrastructures, and other at-risk human interests through a collaborative process of planning,

prioritizing, and implementing hazardous fuels reduction projects. CWPPs are authorized and defined in Title I of the Healthy Forests Restoration Act, passed by Congress in 2003, and are intended to provide a collaborative framework that empowers stakeholders, community members, and residents to take a prominent role in reducing the wildfire threat to their communities. As part of the Marin CWPP update, a science-based hazard, asset, risk assessment was performed using up-to-date, high-resolution topography and fuels information combined with local fuel moisture and weather data. The assessment focused on identifying areas of concern throughout the county and beginning to prioritize areas where wildfire threat is greatest. Hazard mitigation strategies were then developed to address specific issues in the areas of greatest concern. Since its release in summer 2016, the Marin CWPP has successfully served as a framework to facilitate collaborative fuel reduction project planning and implementation.

Keywords: keywords

16. In the (Home Ignition) Zone: the Science that Informs the Firewise Approach
Presenter: Michele Steinberg, Wildfire Division Manager, National Fire Protection Association (NFPA)

Co-Author(s):
Tom Welle, NFPA Wildfire Division Denver Field Office Manager

All three components of the National Cohesive Wildland Fire Management Strategy are interconnected and equally important. The concept of fire adapted communities the places where people live, work and play safely and compatibly in a wildfire environment is often discussed and praised, but may also be dismissed as vague and impossible to implement and measure in a scientific way. This presentation will explore the physical science that must be understood and acted upon by community residents on their individual properties and within neighborhoods and subdivisions before the notion of fire adapted communities can become a measurable reality.
The presenters will discuss the fire science research that led to the key concept of the Home Ignition Zone, which resulted in an entirely new way of approaching the problem of wildland/urban disasters where dozens or hundreds of structures are destroyed during extreme wildfires. This important discovery that there are indeed simple and effective actions that residents can take to prevent home destruction and wildfire disasters is still relatively unknown to a majority of people who need this knowledge. We will point out current research, particularly on home design and construction materials, that are increasing our understanding of wildfire resistant structures, and provide examples of successful use of these techniques in at-risk communities. A robust interactive discussion is planned with participants to explore why starting with the home ignition zone is important and how it factors in to the creation of fire adapted communities and the realization of the Cohesive Strategy.

Keywords: Firewise, fire adapted communties, home ignition zone, residents, fire science

Bio: Michele Steinberg is the Wildfire Division Manager at the National Fire Protection Association (NFPA), leading a team dedicated to wildfire safety outreach. She has worked for NFPA since 2002, starting in its Firewise Program. She has nearly 30 years of professional experience in natural hazard mitigation, land use planning, and disaster safety outreach. She serves on the Board of Directors of the International Association of Wildland Fire and on the Executive Advisory Committee of the Hazard Mitigation and Disaster Recovery Membership Division of the American Planning Association. She holds a Master of Urban Affairs degree from Boston University.

17. Evidence of Effectiveness in the Cohesive Strategy: Measuring and Improving Wildfire Response

Presenter: Toddi Steelman, Executive Director and Professor, School of Environment and Sustainaiblity, University of Saskatchewan

Co-Author(s):
Branda Nowell

Safe and effective wildfire response is one of three key pillars in The National Cohesive Wildland Fire Management Strategy. As wildfires have grown more complex, so too have the responses to these fires. Crossing landscapes and political jurisdictions, large wildfires and the responses to them, create the need to connect stakeholders from local, state, federal, tribal organizations and agencies across public, private and non-profit settings. Creating cohesiveness in wildfire response given these complexities is a key challenge for fire managers, land managers, incident managers, emergency managers and others. Over the past ten years, our research has documented how network based tools can be used on wildfires to create situational awareness of these complexities and measure the effectiveness of how Incident Management Teams, local communities and local Forest Service (or other land management agencies) respond during these events. We quantify what positive outcomes look like and provide opportunities for local communities, land management agencies and Incident Management Teams to learn by identifying areas for improvement. This presentation is a synthesis of several years of work and will provide insight into how we can measure and demonstrate success of cohesive wildfire preparation and response.

Keywords: Wildfire response, effectiveness, measurement, networks, learning

Bio: Dr. Toddi Steelman has a 15 year history working on the human dimensions of wildfire research and has conducted research wildfire in Canada and the United States, including the states of Arizona, Colorado, New Mexico, California, Montana, Wyoming, and Idaho. Her research agenda has focused on understanding community responses to wildfire and how communities and agencies interact for more effective wildfire management. Steelman is also Co-director, with Dr. Branda Nowell, of the Fire Chasers project at North Carolina State University (research.cnr.ncsu.edu/blogs/firechasers/), which focuses on advancing the science of adaptive capacity toward more disaster resilient communities.

18. What the Science Tells Us: Incorporating Wildfire Science at the WUI
Presenter: Katie Gibble, Research Assistant, Boise State University

Co-Author(s):
Eric Lindquist, Director, Boise State University Public Policy Research Center
Jen Pierce, Associate Professor, Boise State University Department of Geosciences

There is a growing supply and demand of science addressing wildfire hazards at the Wildland Urban Interface (WUI), yet what makes science usable and how it is used to make policy decisions is not well understood. This disconnect creates frustration for both scientists conducting wildfire research and for managers who are often prompted to use new science when making decisions. In this mixed methods study, we merge quantitative and qualitative social science methods with public policy theory to identify how stakeholders at the Boise, Idaho WUI use science to inform wildfire hazard policy. We hypothesize that how a manager defines a wildfire problem will determine how that manager uses science to create a policy solution to that problem. To test this hypothesis, we performed content analysis on policies of wildfire stakeholders at the Boise WUI, and coded the policies into distinct categories that classify how they address wildfire hazards. We then conducted interviews with managers representing local, state and federal stakeholders in the Boise WUI to discuss how new, local science may address wildfire hazards they identify as needing policy solutions. Our initial findings show that stakeholders at the Boise WUI address the similar wildfire hazards with unique policy solutions. Science is one of many items considered when creating wildfire hazard policy; interviews reveal that science is most useful when it is quickly understood, and when it can help draw boundaries from which wildfire hazard funding can be allocated and prioritized. With these findings, we present a simple framework that provides policy context to both scientists as they discuss their results with interested stakeholders, and to managers requiring policy context to the wildfire science they are asked to consider. This study may aid to increase the utility of wildfire science at the WUI, thereby increasing the capacity of communities to adapt to wildfire.

Keywords: wildfire hazards, policy, communicating science

Bio: Katie Gibble is an interdisiplinary MS student with a comprehensive background in wildfire, geomorphology, and public policy. She is interested in producing science designed to inform diverse practitioners, specifically at the Wildland Urban Interface (WUI). Her research focuses, geologically, on identifying post-fire debris flow hazards in the Boise Foothills and, in public policy, on identifying how diverse stakeholders at the WUI use wildfire science to inform decisions.

19. Understanding the On-the-Ground Impacts of the National Cohesive Wildland Fire Management Strategy
Presenter: Tamara Wall, Associate Research Professor, DRI

Co-Author(s):

Sarah McCaffrey, Research social scientist, Rocky Mountain Research Station

How have approaches to fire management changed because of the Cohesive Strategy? This presentation presents preliminary findings from a small, targeted survey of fire managers from local, state, federal, and tribal organizations to better understand how fire managers are implementing the Cohesive Strategy, if it has changed how they approach fire management, and how it has impacted those efforts.

Keywords: Cohesive Strategy, Actions, Management

Bio: Dr. Tamara Wall is an associate research professor at the Desert Research Institute in Reno, NV and the Deputy Director of the Western Regional Climate Center. Additionally, Dr. Wall works with the Center for Climate, Ecosystems, and Fire Applications, and the California-Nevada Climate Applications Program (part of the national NOAA-sponsored Regional Integrated Sciences and Assessments network). Dr. Wall holds a Ph.D. in interdisciplinary studies with an emphasis in hazards geography from The University of Montana. Her work focuses on developing wildfire and climate-related research that can be used in decision making and planning efforts by agencies and organizations.

21. LANDFIRE - Foundational Data to Improve Landscape Decisions

Presenter: Henry Bastian, Natural Resource Manager, Dept. of the Interior / Office of Wildland Fire

Co-Author(s):
Frank Fay, Ecologist, Forest Service
Kurtis Nelson, Technical Lead, USGS
Don Long, Technical Lead, Forest Service

LANDFIRE is more than a decade old at producing and updating land cover data products across all 50 United States and insular areas. Although many have thought of it as only a wildland fire data set, the rich array of data layers and databases (vegetation type, cover, and height; successional state and transition models and database; to national plot and polygon databases) have fundamentally improved information integration and decision support for managers and leadership across rangeland, fire, habitat, and natural resources. LANDFIRE served as a critical comprehensive data set for the Cohesive Strategy national priority maps (https://www.forestsandrangelands.gov/strategy/nationalpriorities.shtml). This presentation will explore the background and depth of the LANDFIRE program in advancing data integration and program partnerships in leveraging authoritative data sources through earth observation computing, image and data processing to expand the utility and frequency of geographic land cover data and look at the future of the LANDFIRE program to improve the suite of data products. LANDFIRE is improving mapping change, supporting user feedback/data quality improvements and processes to quantify both the state and condition of the landscapes with consistent wall to wall data through a national remap project. Integrating federal, state, tribal, and local data in LANDFIRE will provide managers with a consistent and

efficient data framework that can be used across multiple levels for future cohesive strategy efforts.

Keywords: LANDFIRE, data, land cover, comprehensive, priority, partnerships

Bio: Henry Bastian is a manager in the DOI Office of Wildland Fire Boise, ID. for enterprise systems & data (NFPORS, IFTDSS, LANDFIRE).
Prior in Washington, DC; he worked on LANDFIRE; performance measures; budget; chair of the Woody BUG, & Emergency Management coordinator (ESF/NRF).
He was the NPS fire ecologist for the Great Basin / Colorado Plateau & worked in all aspects of fire management from administration, budgeting, operations (engine, hand, & helitack crews), fire, & fuels activities.
At Bryce Canyon NP he did resources, wildlife, & fire management. He is a graduate of Snow College & Utah State University.

22. Facilitating Insect & Disease Research & Management Through Forest Fire Compacts
Presenter: Tom Parent, Executive Director - Northeastern Forest Fire Protection Commission, Northeastern Forest Fire Protection Compact

For the past 5 years, the Northeastern Forest Fire Protection Compact, covering the area from New York State through Maine, and Quebec province through Newfoundland/Labrador in Canada, has been working to facilitate the work of the Forest Health community. While wildland fire programs have been mobilizing resources to incidents around the U.S. and Canada for many decades, this practice has not been used to respond to forest health problems. Forest health specialists deal with insect and disease issues that can directly and frequently impact wildland fire occurrence and intensity.
The Northeastern Forest Fire Protection Compact has been successful in implementing interstate and international mobilizations of forest health specialists. Issues addressed included Asian Longhorn Beetle (ALB), Emerald Ash Borer (EAB), Southern Pine Beetle (SPB), and Spruce Budworm (SB). These insects have the potential to kill off large tracts of forest stands that exacerbate forest fire potential and increase the risk to communities. While mobilizations have helped to mitigate some of the infestations, they have also been used to acquire more information about these insects and how to best manage their spread and impact on the landscape.

There are eight Forest Fire Compacts within the U.S. that cover 43 states and include all of the provinces of Canada. This organizational structure, sanctioned by the U.S. Congress and approved by each state and province that participates, is a true demonstration of Cohesive Strategy that impacts wildland fire. The Northeast Compact's approach brings in other communities of practice that contribute to wildland fire management.

In 2012, an Alliance of Forest Fire Compacts was established so that a coordinated approach to wildland fire management could be implemented at the state and provincial levels for the U.S. and Canada. The Northeast Compact's experience can serve as a model for mobilizing and

utilizing the Compact members' capacity and skills to address significant forest health issues that contribute to increased wildfire risks to landscapes and communities.

This presentation will communicate the compact structure of interagency cooperation, provide examples of successful forest health mobilizations addressing mitigation and research purposes, and describe the national and international nature of the Alliance of Forest Fire Compacts, to identify future opportunities for Wildland Fire Cohesive Strategy initiatives.

Keywords: FACILITATING INSECT & DISEASE RESEARCH & MANAGEMENT THROUGH FOREST FIRE COMPACTS

Bio: Tom began his career 42 years ago with the Maine Forest Service - 14 as state forest fire supervisor. He served as Chair of the Northeastern Forest Fire Protection Compact (NFFPC) Operations Committee and many of its Working Teams over the years. As a member of the Northeast Forest Fire Supervisors (NFFS) Tom Chaired the Fire Prevention Committee and the Resolutions Committee; He is Co-Founder and was Co-Chair of the NFFS Aviation Committee. He has served geographic area MAC Groups representing the 20 northeastern states and NFFPC. He was a Steering Committee and cadre member for the States Complex Incident Management Course (CIMC) for 15 years. His experience also includes managing dispatch centers and representing the NFFPC on geographic coordination groups. He has served on a U.S. national committee dealing with Incident Management Team succession planning and on a Canadian national committee dealing with long range planning for the use of U.S. state resources. He is an active member of the Alliance of Forest Fire Compacts and was the founding chair. In addition, Tom represents the Northeast Compact on many regional and national groups as projects arise.
Tom graduated with a B.S degree in Biology from University of Maine at Orono (UMO) in 1975 and received a Pulp & Paper Engineering degree from UMO in 1976. He received much additional job related training throughout his career.

23. An Implementation Model Used on a Landscape in Lake County, Oregon
Presenter: Daniel Leavell, Forestry Agent, Klamath and Lake County and, Oregon State University, Klamath Basin Research and Extension Center and Amy Marcus: Forest Wildlife Biologist, Fremont-Winema National Forest
Amy Marcus, Forest Wildlife Biologist, Fremont-Winema National Forest

It started with a Partnership. The Klamath-Lake Forest Health Partnership (K-LFHP) was initiated in the early 1990's with an objective to: Facilitate restoration projects on public and private forestland in Klamath and Lake Counties through education, outreach, and diverse partnerships. 2014 was a year to adjust and to fulfill this objective. Federal, State, County, and University representatives and private landowners strengthened this Partnership by selecting a forested landscape in Lake County to develop and test a model to implement resource management objectives that restores fire-adapted ecosystems, achieves fire-resistant landscapes, improves wildlife habitat and rangeland, and provides for an economic return to local contractors and businesses across all land ownerships.

Steps of this model include: 1. Project boundary identification (coordinating private lands with NEPA-ready Forest Service landscape projects); 2. Private landowner outreach and education (reaching out, contacting, workshops, networking); 3. Private land map and inventory (personalized design of various scale maps, field validation, and ancillary information collection); 4. Private landowner support consistent with resource management objectives of the agencies (consulting with each landowner with information collected sufficient to assist in land management plans for their objectives); 5. Cooperative implementation across public and private lands (NRCS Farm Bill Authority, ODF and FS Good Neighbor Authority, etc.).
The landscape selected was approximately 60,000 acres of forested land, divided between the Fremont-Winema National Forest and private, non-industrial land ownership, having about 17 private land owners. The model is working and we intend to use this as a template to guide efforts on additional landscapes in Klamath and Lake County.

Keywords: Landscape, Restoration, Forest Health, Fire Resiliency

Bio: Daniel Leavell is the Oregon State University Forestry and Natural Resources Extension Agent for Klamath and Lake Counties and an Assistant Professor of Forestry, Natural Resources, and Fire Science at Oregon State University.

Amy Markus is the Forest Wildlife Biologist on the Fremont-Winema National Forest. She has worked as a wildlife biologist for 20 years with a particular interest in landscape level restoration planning.

24. Providing Strategic Meteorological Support in the Digital Age

Presenter: Bryan Henry, Assistant National Fire Weather Program Manager Predictive Services, USFS

Co-Author(s):
Heidi Strader, Predictive Services Fire Weather Program Manager, Alaska Interagency Coordination Center

Data trends continue to show fire season severity increasing across the United States as the wildland-urban interface expands. Each year fire managers assess, develop, and implement strategies designed to provide the most effective and efficient response to wildfire activity. The role of science is a critical component in the process. It not only provides answers to questions that have been asked for years, but solutions as well. The nexus of where research meets application is Predictive Services.
Since 2000 Predictive Services has worked with fire managers at the regional and national levels to provide timely weather and fuels information to aid in resource allocation and distribution while enhancing firefighting safety through increased situational awareness. In recent years, the program has evolved its flagship forecast products the 7-Day Fire Potential Outlook and the Monthly/Seasonal Outlookswhile introducing conduits for conveying new and existing information that allows for the development and implementation of more effective fire management strategies, such as the National Fuel Moisture Database, Multimedia Web

Briefings, Santa Ana Wildfire Threat Index, and the Great Lakes and Alaska Fire and Fuels pages.
During this period the availability of weather and fuels data has become more accessible and has led to more in-depth analyses. Through partnerships with leading researchers and developers, Predictive Services has begun to take the next step in the process from assessing fire potential to making fire prediction. With gridded data now readily available, the capability exists to move beyond fixed boundaries that are based in part upon groupings of RAWS weather stations. Information can be displayed with finer detail that will allow for decision makers to better define critical areas. Future products will ingest and process the gridded data and will allow for users to define how the information is displayed be it via averages across fixed boundaries, user defined boundaries, or raw data with no boundaries at all.
As science and technology advance, Predictive Services will continue to evolve to bridge the gap between research and operations so that the best fire management decisions can be made.

Keywords: The evolution of Predictive Services forecast support

Bio: Bryan Henry serves as the Assistant National Fire Weather Program Manager for Predictive Services at the National Interagency Fire Center in Boise, Idaho. Prior to that, he worked as a meteorologist at the Northern Rockies Coordination Center and as a Senior Forecaster and Incident Meteorologist with the National Weather Service in Missoula, Montana. He is a veteran of the United States Air Force and a graduate from Georgia Institute of Technology. He is a recipient of the Department of Commerce's Gold Medal (2005). Hobbies and interests include wildlife photography/viewing, fishing, hiking, and working with street people and orphans in the barrios and ghettos from and in Latin America.

25. Wildfire Hazard-and-Risk Assessment Concepts, Terminology and Analyses
Presenter: Joe H. Scott, Principal Consultant, Pyrologix LLC

Co-Author(s):
Julie Gilbertson-Day, Spatial Analyst, Pyrologix LLC

This seminar begins with a review of common (all-peril) hazard and risk concepts and terminology, with specific reference to wildfire as a source of potential harm or damage (a peril). From that foundation, we will review the array of possible wildfire hazard and risk assessment types and discuss their intended applications and relative merits. The main dichotomies include exposure analysis (fire-oriented) vs. effects analysis (resource- or asset-oriented), and assessments of the sources or wildfire risk vs. assessment of where wildfire risk occurs. Some of the specific wildfire-risk concepts we will discuss include biophysical firesheds, risk transmission, risk source, and apportionment of wildfire risk to landscape units. We will conclude with examples of different types of wildfire hazard and risk assessment. With those examples, we will demonstrate the use of exceedance-probability charts (extreme value analysis), Lorenz curves, and a wildfire risk characteristics charts to convey wildfire risk and its distribution across space or some other dimension (e.g., fire size).

Keywords: wildfire hazard, wildfire risk, burn probability, risk transmission, risk management

Bio: Mr. Scott has led projects related to surface and canopy fuel characteristics, wildfire behavior modeling, crown fire hazard assessment, and wildfire risk assessment. Mr. Scott is the lead developer of NEXUS; lead developer of FireWords; lead developer of a set of standard fire behavior fuel models for national application; and the lead author of a USFS report detailing a quantitative wildfire risk assessment framework. Mr. Scott's current work focuses on the application of Monte Carlo wildfire simulations to wildfire risk assessment and land management planning for private enterprises and local, state and federal government agencies.

26. USFS Forest Plan Revision: A Vehicle to Collaboratively Implement the Cohesive Strategy Across Mental and Physical Boundaries Using Geospatial Fire Planning
Presenter: Colleen (Chaz) O'Brien (POC), Intermountain Region USFS - Regional Collaboration Specialist (O'Brien), Regional Fire Planner (Brown), Ecologist (Pelz), USFS Intermountain Region

Co-Author(s):
Gary Brown Regional Fire Planner USFS Intermountain Region
Kristen Pelz, Ecologist USFS Intermountain Region staff

Participants will learn about the USDA Forest Service Planning Rule (2012) and the fire science geospatial planning approach being applied in the Intermountain Region of the USFS during the first phase of plan revision, known as the Assessment Phase. The 2012 Planning Rule directs National Forests to develop land management plans which integrate across traditionally-separated resource areas and manage for ecosystem integrity despite ownership boundaries that cut up the landscapes. Considering wildland fire is both a major driver of ecosystems and USFS spending,the priorities identified in the National Cohesive Wildland Fire Management Strategy (the Strategy) are extremely relevant to forest planning. USFS staff will present the information needed for all audience members to contribute in a facilitator-led Learning Laboratory style Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis on how forest plan revision might act as a vehicle for the implementation of the Strategy with an All Hands, All Lands approach. Participants from local, state, federal, tribal, industry, insurance and other affected sectors are strongly encouraged to attend. Help the USFS move "beyond the green line".

Come ready to think, innovate, and create!

Keywords: Working across boundaries, All Hands All Lands, Cohesive Strategy

Bio: Chaz is a human ecologist, landscape architect and planner (land use, natural resource, community and collaborative). Prior to joining the US Forest Service (USFS) in 2002, she spent a decade in private sector planning and design firms, as well as the CA Department of

Transportation. Her private sector experience includes a wide range of urban land use, community planning and landscape design projects. Since joining the USFS in 2002, Chaz has provided services in strategic, natural resource, collaborative and community planning; environmental conflict resolution; facilitation; project management; and interdisciplinary team management. She has a passion for large scale landscape projects which merge systems thinking and systems engineering for landscape resiliency in a human ecological context.

27. Safer Communities and Better Fire Management "What International Science is Telling Us"

Presenter: David Bruce, Communications Manager, Bushfire and Natural Hazards Cooperative Research Centre
Alen Slijepcevic, Deputy Chief Officer, Country Fire Authority, Victoria, Australia.
Murray Carter, Director, Office of Bushfire Risk Management, Department of Fire and Emergency Services, Western Australia

This session will show the critical role of science in the planning and implementation of bushfire management in Australia.

The science has a symbiotic relationship with bushfire management it both drives and leads the policy and strategic decision making, while also being informed by actual operations, analyses and formal inquiries into destructive fires.

Over the last 15 years in Australia bushfire science has been embedded in fire and land management agencies through the Australian Government funded Cooperative Research Centres program. The program awards funding only if it can be shown that the research sector and the end users (in this case, the fire and land agencies) are working collaboratively at all stages over many years including defining the research questions, developing the research project, monitoring ongoing progress, and utilising the outcomes.

Drawing on two case studies from western and eastern Australia the session will demonstrate how the sentiment of the US Cohesive Wildland Fire Strategy All Hands, All Lands - is being echoed on another continent through science integrated with policies and practices. Planning and policy decisions on bushfire risk management in Western Australia have taken a tenure blind (All Lands) approach that includes participation by fire and land management agencies, local governments, state planning authorities, power and water utilities, agriculture and viticulture, and community groups (All Hands). Key to the success of this initiative has been the establishment of guidelines to support a consistent approach to bushfire risk management planning, coordinated by 140 local governments.

Science has also been integral to the development and implementation two key policies in Victoria, both of which aim to ensure communities share the responsibility by taking positive actions to reduce their bushfire risk.

The Living with Bushfire policy draws on research to provide direction on increasing the area of public and private land treated with fire to reduce fuel loads, maintain ecosystems and manage fire risk.

The Safer Together policy seeks to ensure that fire and land management agencies and the community work as one to reduce bushfire risk, with the three goals of safer communities, thriving rural economies and healthy environments.

Keywords: fire science, fire management, risk management, policy, community education

Bio: David Bruce is the Communications Manager for the Bushfire and Natural Hazards Cooperative Research Centre in Australia. He is also a Board Member of the IAWF, a member of the IAWF Board's Strategic Planning Committee and Communications Committee, and Chair of the Editorial Board of Wildfire Magazine.

28. Trans-Boundary Risk – Concepts and Case Studies to Support Cohesive Strategy Implementation

Presenter: Alan Ager, Research Forester, USDA Forest Service

Co-Author(s):
Cody Evers, Doctoral Candidate, Portland State University
Palaiologou Palaiologos, Visiting Scholar, USDA Forest Service International Visitor Program and Portland State University
Max Nielsen-Pincus, Assistant Professor, Portland State University
Michelle Day, Faculty Research Assistant, Oregon State University
Tom Quigley, Private Consultant

All lands wildfire policy and related management initiatives emphasize collaborative, cross-boundary solutions to fire management issues. Implementation of cross-boundary fire management strategies is key to achieving the main goals of the Cohesive Strategy. However, mapping risk from large wildfires and partitioning it among landowners and communities is a complicated problem, and new concepts and tools are needed to build a common understanding of cross-boundary risk. In this talk, we report on our efforts to assess and map how risk is shared among diverse land ownerships (federal, private industrial forest, and state lands), and between large landowners and communities in the western US. We mapped zones of public and private lands that transmit fire into 5200 communities, and partitioned wildfire exposure according to the landowner of origin. We combined these outputs with information on fuels and potential fire behavior to identify 8-10 distinct community transmission archetypes. These archetypes differed in terms of the composition of fuels and potential fire behavior on both the public and private lands, and the number of landowners that contribute wildfire into the communities. For the surrounding public lands and large private landowners, we analyzed how cross-boundary risk was related to land fragmentation patterns and ecological conditions. We then examined how wildfire exposure in the different community archetypes can be addressed with the three main goals of the Cohesive Strategy. The results

illustrate how the spatial scale of biophysical risk to socioecological values is a major driver of cross-boundary wildfire exposure. The analysis framework fills a gap in local and regional planning frameworks, including collaborative and community wildfire protection planning, by assessing cross-boundary risk and by identifying scale mismatches between potential future wildfire events and local planning efforts. The methods also provide a fine-scale spatial interpretation of the Cohesive Strategy that has been largely lacking in ongoing implementation efforts. Local and regional risk planning processes can adopt our concepts and methods to map the scale of wildfire risk from large fire events and incorporate wildfire connectivity into risk assessments.

Keywords: Risk transmission, Wildfire networks, Community firesheds, Scale mismatches, Risk scaling

Bio: Alan Ager is a research forester at the USDA Forest Service Fire Sciences Laboratory in Missoula, Montana and has worked on a wide range of research and management projects since starting with the Forest Service in 1987. His current interests include wildfire risk management and modeling alternative future forest management scenarios with agent-based models; combining simulation modeling with network analysis to disentangle wildfire risk transmission among diverse landowners; exploring socio-ecological systems approaches to improve wildfire mitigation planning; and using spatial optimization and production possibility frontiers to understand tradeoffs among ecosystem services.

29. Improving the Co-management of Cross-Boundary Fire Risk Transmission

Presenter: Daniel Williams, Research Social Scientist, US Forest Service, Rocky Mountain Research Station

Co-Author(s):
Alan Ager, Research Forester, Rocky Mountain Research Station
Patty Champ, Research Economis, Rocky Mountain Resaerch Station
Sarah McCaffrey, Research Social Scientist, Rocky Mountain Resaerch Station

Reducing wildland fire risk to lives, property, and landscapes is among the most intractable and expensive problems facing the U. S. Forest Service and consequently represents an urgent and high priority research topic within Forest Service R&D. The Forest Service invests over $300 million annually in fuel reduction projects, but lacks sufficient knowledge of how to effectively engage community partners in the collective management of those risks. A key problem is that wildfire processes operate at landscape scales in which threats, risks, and benefits and costs are transmitted (and thus shared) across a complex geographic network of co-dependent stakeholders and land ownerships and thus requires an all hands all lands approach. This presentation introduces a new research management partnership within USFS between Fire and Aviation Management and the Rocky Mountain Research Station aimed at investigating ways to improve hazardous fuels investments through cross-boundary collaboration among co-dependent stakeholders. The project will target selected communities in the Western US for hazardous fuels investments where there is especially high fire risk transmission from

Forest Service lands to private homes and property. These case studies will be used to test and evaluate innovative, locally driven approaches to engagement that result in reduced risk. Case studies will (1) document the biophysical and social characteristics of communities and the surrounding landscape associated with wildfire risk reduction and/or barriers to risk reduction; (2) develop a systems approach to collaborative learning to improve cross-boundary risk sharing and enhance long-term sustainability and community resilience to wildland fire risk, and (3) use the lessons learned to improve that application of Forest Service funding, strategies and programs to meet the goals of the Cohesive Strategy. These efforts will be documented and reported to understand the differences both across communities and through time to strengthen our understanding about which community types are most likely to successfully implement and sustain risk reducing actions, how best to work with communities to advance fuels management and other restoration actions, and how risk sharing between communities and the Forest Service evolves over time based on experience of these efforts.

Keywords: fire-adapted communities, cross-boundary risk governance

Bio: Daniel R. Williams is a Research Social Scientist with the USDA Forest Service, Rocky Mountain Research Station in Fort Collins, Colorado. His research focuses on the human dimensions of landscape change and, in particular, the use of place-based inquiry and practice to inform the adaptive governance of complex social-ecological systems. He served Co-Editor-in-Chief of Society and Natural Resources from 2011-2014 and recently co-edited Place-based conservation: Perspectives from the social sciences, published in 2013 by Springer Publications.

30. Revisiting Wildfire Risks after the Historic 2016 Southern Appalachian Fire Season

Presenter: Danny Lee, Center Director, Eastern Forest Environmental Threat Assessment Center, USDA Forest Service

Co-Author(s):
Steven P. Norman, Ecologist, Eastern Forest Environmental Threat Assessment Center, USDA Forest Service

The Southern Appalachians experienced more high-profile wildfires in the fall of 2016 than anytime in living memory. As extreme drought and an epidemic of arson ignitions aligned, multiple large fires burned over 140,000 acres across this intermix of federal, state and private land during the months of October and November. On federal jurisdictions, far more area burned in 2016 than during all prior fall fire seasons combined since 1970, and long fire durations exposed residents to unhealthy smoke for weeks. The most tragic of these fires started in the Great Smoky Mountains National Park, and led to the loss of 14 lives and over 2000 homes during a fire storm driven by winds that exceeded 100 mph. This unprecedented fire season and its attendant impacts call for a reexamination of wildfire risk in this landscape, with implications for how likely such outcomes are to recur under current or future conditions. We leveraged existing climate and wildfire datasets to calculate the likelihood of 2016's outcome using relatively simple probabilistic models commonly applied to wildfire. We show

that although the 2016 fall drought and fire season was unusual, it was not outside the realm of expectation. Such results do not mean, however, that the region's fire season was inevitable. Nearly all of 2016's wildfires were human-caused, with the majority intentionally set, suggesting that the 2016 outcomes were largely preventable. The region's recent experience both reinforces the need to prepare for extreme wildfire events, and reminds us that education and enforcement are vital tools in reducing future risks in this human-ignition-dominated landscape.

Keywords: Risk assessment, climate, Southern Appalachians

Bio: Dr. Danny C. Lee is the Director of the U.S. Forest Service's Eastern Forest Environmental Threat Assessment Center, established to develop knowledge and tools needed to predict, detect, and assess environmental threats to forests in the eastern United States. The Center is headquartered with the Southern Research Station in Asheville and has offices in Raleigh and Research Triangle Park, NC. Dr. Lee previously served as the co-leader of the National Science and Analysis Team assigned to the National Cohesive Wildland Fire Management Strategy effort led by the USDA Forest Service and US Department of Interior.

31. Addressing Limitations in the Current Wildfire Risk Assessement Framework: Crossing Spatial and Temporal Boundaries

Presenter: Jessica R Haas, Ecologist, US Forest Service, Rocky Mountain Research Station

Currently, the most widely used wildfire risk assessment framework (Scott et al 2013, A Wildfire Risk Assessment Framework for Land and Resource Management, RMRS-GTR-315) addresses in-situ wildfire risk for a given period of time, typically directly after the fire occurred. However, the responses of values at risk often change through time and many values respond to fire even if they are not directly exposed to the wildfire. In order to meet the Cohesive Strategy's intent of an all hands, all lands approach to living with wildfire, these two limitations of the wildfire risk framework need to be addressed. Drawing on examples from debris flow modeling, wildlife habitat modeling and air quality modeling, I will demonstrate ways that we can begin to incorporate temporal and spatially disjoint response functions into the wildfire risk assessment, using a new approach called multi-dimensional response functions. Multi-dimensional response functions can allow managers to begin to address wildfire risk to adjacent lands and future generations. I will end with an overview of areas where further research still needs to be completed.

Keywords: risk assessements, cross boundary, temporal, values at risk

Bio: Jessica R Haas is an ecologist with the US Forest Service Rocky Mountain Research Station, where she has worked for the past seven years on wildfire and natural hazard mitigation science. Her work with the Rocky Mountain Research Station has been used nationally to support wildfire and natural hazard mitigation efforts for the major land managers such as the US Forest Service, BLM, The Nature Conservancy, as well as various state forestry departments throughout the western United States. She received her Masters of Science degree in Resource Conservation in 2010 from the University of Montana, where she

studied the vulnerability of national parks to climate change and ex-urban development. Before going back to school, she worked as a private consultant assisting in open space planning and conservation easement planning throughout the west. Additionally she was an archaeologist for the US Forest Service, BLM and a private consulting firm.

32. Fire Science Informing Fire Management: the US Geological Survey
Presenter: Paul Steblein, Fire Science Coordinator, USGS

Science is fundamental to the National Cohesive Wildland Fire Management Strategy of the United States. Now more than ever, it is imperative that best available science be used to inform newly developed fire management policies and planning efforts. The proposed session will provide examples of manager-scientist collaborations that resulted in the timely integration of best available science into important management and conservation decisions. These examples will include various spatial scales, geographic regions, short and long-term issues, and various agencies/stakeholder types. They will highlight partnerships among agencies of the Department of the Interior, including the US Geological Survey which is charged primarily with providing relevant science in support of federal lands management. Examples will also illustrate how US Geological Survey fire science supports the broader needs of society to implement the Cohesive Strategy. The session will utilize a tag team approach with a USGS scientist describing the science need and how the end-products were developed and a manager explaining how the science products were used to solve a problem or better address an issue. Additionally, the session will consist of opening and closing talks to setup and summarize the relationships and processes among these successful collaborations.
Outline for tag-team talks: 1) USGS scientist briefly introduces the management/societal need for the science and explains the science products that addressed that need (10 minutes max); 2) DOI or other federal/state/local land manager or other end-user (e.g. water district manager) explains how the science was used in management planning and/or actions (5 minutes max); 3) overage time plus Q&A and transition (5 minutes max).

U.S. Geological Survey Fire Science Informing Fire Management
Presenter: Paul Steblein, Fire Science Coordinator, U.S. Geological Survey, Headquarters, Reston, VA

Science is fundamental to the National Cohesive Wildland Fire Management Strategy of the United States. Researchers and managers are finding new fire science efforts are still required to support decision making by fire and land managers and the public because of the complexity of changing conditions affecting wildfires, and the consequence of those fires on people and ecosystems. U.S. Geological Survey (USGS) wildland fire research, data and tools are essential to decision making before, during, and after wildfires, and are used by fire and land management agencies, States and Tribes, landowners and communities across the United States. The scope of fire science conducted by USGS ranges from local to national in scale, covers many regions and vegetation types across the country, and involves many kinds of research. Example areas of USGS science support for implementation of the Cohesive Strategy include developing/providing geospatial data, models and tools, and satellite data;

assessing the risk of flooding, sedimentation and debris flow following wildfires; effects of wildfire on water availability, quality and treatability for municipal use; characterizing fire history and factors affecting wildfire risk; effectiveness of fuels treatment and prescribed fire on wildfire and consequent effects on wildlife and ecosystems; assessing the risk of wildfire on endangered species, cultural resources, wildlife and other ecosystems services; evaluate post-fire ecosystem effects and management options to support recovery; and the interrelationship of invasive species, human development, drought and other factors on wildfire and ecosystems. The USGS works closely with managers to define issues, identify science needs, and develop research, data, and tools needed to support management efforts to address those issues.

Bio: Early in his career, Paul served as a scientist with the N.Y. Biological Survey, and joined U.S. Fish and Wildlife Service to establish a GIS/Data Center for the northeast region. Since then, he has served in the National Wildlife Refuge System at refuges and in headquarters addressing a multitude of difficult natural resource issues, including wildland fire. Paul recently joined U.S. Geological Survey (USGS) from the Department of the Interior Office of Wildland Fire where served as Deputy Director Policy and Budget and sat on the Governing Board of the Joint Fire Science Program. Sound science, grounded in policy, and collaboration with stakeholders were fundamental principles for resolution of complex natural resource issues. At the USGS, Paul is working with scientists and stakeholders to develop and implement a fire science program.

Geospatial Fire Data and Tools for Fire Research and Management
Presenters: Birgit Peterson, Fire Focus Area Principal Investigator, U.S. Geological Survey, EROS, Sioux Falls, SD
Henry Bastian, Department of the Interior, Office of Wildland Fire, Boise, ID.

Geospatial data are needed to study natural land processes and to understand how natural systems change and though time and over space. Furthermore, such data are also key for the planning, implementation, and assessment of management decisions and their impacts on landscapes. Having comprehensive, high-quality spatial data products enables the monitoring of management activities in a consistent fashion. For example, with data available at consistent thematic and spatial resolutions, regional and temporal trends are easier to identify and analyze. The USGS Earth Resources Observation and Science (EROS) Center develops and hosts several nation-wide geospatial data products and tools, specifically the LANDFIRE, MTBS, and GeoMAC projects. EROS also houses an extensive archive of Landsat imagery with various tools to browse and acquire the data, which is available to the public free of charge. These products and tools focus on the integration of remotely sensed data into applications that support various fire management decisions and activities. EROS research has focused on leveraging satellite imagery, primarily from the suite of Landsat systems, to map vegetation type and structure, fuels, burn severity and fire perimeters. The methods used to develop these products and applications are science driven, with developers seeking robust solutions for product and tool development. The projects attempt to communicate regularly with end users to ensure that their data and products meet needs and retain relevancy. For example, a

team of researchers is currently in the process of prototyping appropriate methodologies to implement in the upcoming LANDFIRE Remap. In this Remap, new imagery and field data are being assembled to derive new LANDFIRE basemap vegetation and fuels products. EROS products are used for various management applications within the fire community. LANDFIRE products are used strategically to plan for and assess the impacts of fuel treatments on the landscape. They are also used tactically to model fire behavior on active fires. MTBS data are used by land managers to assess historical trends in burn severity and plan management activities. GeoMAC integrates various data sources and provides fire managers up-to-date information. All products are publicly available through web interfaces and are free to use.

Bio: Birgit has been affiliated with EROS for 12 years, initial moving there to support the LANDFIRE project as an onsite analyst for the USFS Forest Inventory and Analysis program. While her fire-focused research has been primarily driven by LANDFIRE, she has also focused on using remotely sensed data to better describe the structure of forests through the inclusion of lidar data. Her background as a geographer promotes an interest in understanding spatial processes and observing patterns in the landscape.

Rapid Identification of Post-Wildfire Hazards and Risks
Presenters: Jason Kean, Research Hydrologist, U.S. Geological Survey, Golden, CO
Jeremy Lancaster, Senior Engineering Geologist, California Geological Survey, Sacramento, CA

Steep, recently burned watersheds are very susceptible to dangerous flash floods and debris flows. After a wildfire, local officials and land managers must rapidly assess the risk these hazards pose to federal, state and private lands. Since there is often little time between the end of the fire and the first rain storm, such assessments must be made on very short time scales (~week). Here, using recent wildfires in central California as examples, we describe the science and partnerships that have emerged to help meet the need for timely and accurate post-wildfire risk assessment. Specifically, we describe how U.S. Geological Survey (USGS) models for estimating the probability and volume of post-wildfire debris flow were used by CAL FIRE and the California Geological Survey (CGS) to identify values-at-risk and to assist in the implementation of hazard mitigation measures. The USGS models use simple metrics of topography and burn severity to rapidly generate maps depicting the likelihood and expected volume of debris flow across the burn area. The hazard maps provided a base map for a field-based determination of risk and on-site mitigation measures across the burn area by CGS. The combination of local observations and hazard modeling provide a detailed and rapid risk assessment that would not have been possible without the partnership. Ongoing research by the USGS and CGS is working to improve the accuracy of post-wildfire hazard assessment for central California, as well as develop criteria providing flood and debris-flow early warning in burn areas.

Bio: For the past 11 years, Kean's research has focused on understand the processes controlling debris-flow initiation and growth, particularly after wildfire. This research involves

monitoring debris flows in recently burned areas and using the observations to develop practical tools for assessing post-wildfire hazards.

Jeremy Lancaster is a Senior Engineering Geologist with the California Geological Survey's Forest and Watershed Geology Program. He has been working on debris flow and alluvial fan hazard issues at CGS for about 10 years.

Planning for Effects of Wildfire on Water Supplies: A Case Study of Button Rock Preserve Near Longmont, Colorado
Presenters: Deborah Martin, Research Hydrologist, U.S. Geological Survey, National Research Program, Boulder, CO
Keith Stagg, Watershed and Wildfire Resiliency Coordinator for the City of Longmont, Colorado

Forests and grasslands are recognized as important source-water areas for municipal water supplies. In the last two decades, several municipal water providers have experienced the impacts of runoff and erosion from burned areas. In Colorado, post-fire responses have included hillslope and channel erosion, and the transport of ash, partially burned organic matter, surface soil and contaminated sediments to streams and reservoirs. These post-fire responses present challenges for water providers mainly as a result of increased stream and sediment discharges, floating debris, altered water chemistry and reservoir sedimentation. Field-based research by USGS scientists has led to the identification of several factors, including rainfall intensity thresholds and fire-induced changes in soil properties, which affect post-fire responses. Insights gained from studies of post-fire runoff, erosion and the timing and magnitude of changes to water chemistry have allowed USGS scientists to provide guidance to watershed managers and water providers after fire and on a pre-fire basis to promote planning efforts to mitigate post-fire impacts.

The City of Longmont maintains a 16,000 acre-foot reservoir and water intake infrastructure on North St. Vrain Creek that provide two thirds of the municipal water supply for the city and neighboring communities. This water supply infrastructure is contained within the 3,000 acre Button Rock Preserve, while the larger watershed is owned and managed primarily by Boulder County Parks and Open Space and the US Forest Service. The watershed, in the Front Range Mountains of Colorado, is characterized by lower montane ponderosa pine and upper montane mixed conifer ecosystems. The City recently updated the Forest Stewardship Plan for this property to account for the eventuality of wildfire. The Forest Stewardship Plan incorporates restoration and wildfire resiliency to the greatest extent possible, and initiates a program with the other major public landowners to manage the larger watershed. In this process, City staff have consulted with USGS scientists to understand results and insights based on post-fire research conducted in nearby watersheds. USGS research is a component of supporting information used to advocate for restoration and post-wildfire planning resources, and has provided context for prioritizing pre-fire mitigation project areas within the larger watershed.

Bio: Deborah Martin has studied the hydrological and erosional responses of burned watersheds for over twenty years. The main objectives of her research are: (1) to understand conditions that lead to post-fire runoff, erosion, and water quality effects, (2) understand the formation, composition, and biological and chemical reactivity of ash and charcoal; (3) understand the role of fire and post-fire responses in the biogechemical cycles of several elements, including carbon; and (4) contribute to national and international efforts to identify the potential for post-fire impacts before fires burn in critical watersheds. She places a high priority on efforts to convey information about potential post-fire responses to land and emergency managers, water providers, watershed coalitions, policy makers and the public.

Keith Stagg is developing a forest stewardship plan and program for the 3,000-acre Button Rock Preserve that serves as Longmont's municipal supply watershed, and is managing a river restoration program in response to the September 2013 floods on the Front Range. Prior to this work, Keith was the Policy and Standards Manager for the Forest Stewardship Council (FSC) where he developed forest management standards for the 35 million acres of FSC-certified timberlands nationwide. He has also worked in a variety of river conservation initiatives throughout the American West, and holds a Master of Environmental Science degree from the Yale School of Forestry.

Paradigm Shifts in Non-Forested Ecosystems
Presenters: Jon E. Keeley, U.S. Geological Survey, Western Ecological Research Center
Marti Witter, National Park Service, Santa Monica Mountains National Park

For much of the 20th century fire managers charged with protecting natural areas in southern California relied heavily on research from western US forests. These studies emphasized the value of pre-fire vegetation management as a means of reducing fire risk, e.g. prescribed burning, for both resources and public safety. However, at Santa Monica Mountains National Recreation Area (SMMNRA) there was a major paradigm shift away from landscape scale vegetation treatment to strategic placement of treatments especially defensible space. Their most recent fire management planning focuses on collaborative planning and fire prevention strategies based on the Cohesive Strategy framework. USGS fire research was heavily cited in these plans as the scientific basis for these radical changes.

Unlike many western US forests, fire regimes in southern California are seldom fuel-limited rather they are primarily influenced by extreme weather events that can produce catastrophic fires regardless of fuel levels. Although these fires are largely the result of extreme Santa Ana winds they are limited by anthropogenic ignitions that occur during these extreme weather conditions at locations where they can spread rapidly and escape control. As a consequence, high fire frequency, dominated by human ignitions, is one of the major threats to the park's natural resources, equal to threats from urbanization and fragmentation. Landscape level fuel treatments such as prescribed burning or fuel breaks do not limit the spread of wind-driven wildfire in southern California shrublands, and the vast majority of acres are burned under these conditions. Therefore, the SMMNRA has concluded that the only viable management

option for landscape resilience is to limit fire frequency by reducing the number of ignitions during extreme weather conditions.

Similarly, the importance of limiting ember ignitions with structural hardening and defensible space to prevent structure losses in the WUI has re-oriented fire management from landscape-scale treatments to focus on house-out defensible space. Emphasizing fuel modification that is limited to what is necessary for defensible space, increases landscape resilience by reducing habitat loss and fragmentation and improves community wildfire safety. These management principles underlie planning and implementation for the current Santa Monica Mountains Wildland Fire Resilient Landscape Collaborative.9:40-10:00 Fuel breaks to reduce the loss of sagebrush habitat: understanding their ecological effects (Douglas Shinneman USGS and TBD BLM)

Fuel Breaks to Reduce the Loss of Sagebrush Habitat: Understanding Ecological Effects
Presenters: Douglas Shinneman, Research Fire Ecologist, USGS, Forest and Rangeland Ecosystem Science Center
Don Major, Fire and Landscape Ecologist, BLM, Idaho State Office

Fuel breaks are being newly constructed, enhanced, or proposed across large areas of the sagebrush biome to increase the safety and effectiveness of fire suppression tactics, reduce fire size, and protect remaining sagebrush ecosystems and greater sage-grouse habitat from fire. Fuel break projects are considered a key strategy to conserve intact sagebrush ecosystems, yet they are also likely to result in thousands of linear miles (and hundreds of thousands of acres) of habitat disturbance and loss through removal of vegetation and conversion to fire-resistant vegetation. These projects may also affect millions of acres indirectly because of edge effects and habitat fragmentation created by a network of fuel breaks. Yet, there is relatively little published science that directly addresses the effectiveness of fuel breaks to influence fire behavior in dryland landscapes, or that addresses the potential ecological effects of the construction and maintenance of fuel-breaks on sagebrush ecosystems and associated species. The USDI Integrated Rangeland Fire Management Strategy Actionable Science Plan identifies these and other aspects of fuel breaks as high priority areas for scientific research. We are gathering and synthesizing available information to evaluate the efficacy of fuel-breaks and to explore the nature and extent to which fuel breaks might be utilized across the Great Basin for the purpose of protecting existing habitat from wildland fire impacts. In the presentation, we will discuss the following: 1) the strategic role of fuel breaks in wildfire suppression and their effectiveness at altering wildfire behavior; 2) how different types of fuel breaks affect sagebrush plant communities, and 3) how fuel breaks are likely to affect sagebrush-associated wildlife species. We will also discuss these topics in the context of fuel break configurations/networks across broad spatial scales and their persistence over time.

Bio: Dr. Shinneman's research interests include fire ecology, landscape ecology, plant ecology, and landscape modeling. Since joining the USGS in 2009, his work has focused on the role of fire, climate, and land use in shaping a variety of ecosystems in the western U.S., ranging from

sagebrush shrublands to mountain forests. His goal is to produce research results that are both scientifically valuable and directly useful to land managers, especially given the myriad challenges facing our western landscapes and natural resources.

Dr. Major's research interests include fire ecology, landscape ecology, landscape modeling, and remote sensing. Since joining BLM in 2007, he has worked to expand BLM's use of applied science to inform current and future land management opportunities. His goal is to foster effective communication between science and management that results in useful science information for on the ground conservation.

Keywords: Fire Science Informing Fire Management

33. What Do We Know about Wildfire and Local Fire Department Capacity?
Presenter: Hylton Haynes, Senior Research Analyst, National Fire Protection Association

Learn about a first-of-its-kind study exploring the needs of local fire departments regarding wildfire through a series of in-depth conversations and surveys. The National Fire Protection Association (NFPA) interviewed fire chiefs and senior line officers who cope with significant wildfire events in their jurisdictions to cast a wide net and gain knowledge about an under-researched issue: the capacity and challenges of local fire departments in wildfire operations, safety and community mitigation. NFPA's analysis of the data provided in the National Fire Incident Reporting System (NFIRS), the largest fire database of its kind in the world, reveals that brush, grass and forest fires make up 75% of all local fire department calls in the United States more than 900 per day in an average year. Through interviews with fire officials who had experienced a major wildfire within the last five years, NFPA examined whether and how local fire departments change and adapt following a major fire event, and identified critical factors that facilitate or constitute barriers to being better prepared and ready to control and mitigate a wildfire incident in their communities. The presenter will connect this qualitative analysis with the quantitative results of the Fourth Needs Assessment of the U.S. Fire Service, conducted in 2015 and including comparisons to the 2001, 2005 and 2010 Needs Assessment Surveys. The current survey questions were modified to address what we don't yet know or understand about municipal fire department wildfire capabilities and preparedness, including training, personal protective clothing and the use of auxiliary roles when responding to wildfire events. Since 88% of the nation's 26,000 local fire departments respond to wildfires, it is important to characterize and describe their capacity to manage these challenging incidents.

Keywords: fire departments, municipal, rural, volunteer, research, NFPA, survey, preparedness

Bio: Hylton Haynes is Senior Research Analyst for the National Fire Protection Association (NFPA) and has been with the NFPA since 2011. His current responsibilities include researching the U.S. Fire Service. He has over 15 years of natural resource and wildland fire management experience on two continents and is a Society of American Foresters Certified

Foresters. Hylton holds a B.S. degree from the University of Stellenbosch, South Africa and an M.S. degree from Virginia Tech, both in Forestry.

34. Uniting Research and Practice to Promote Fire Adaptation: The Wildfire Research (WiRē) Team

Presenter: Hannah Brenkert-Smith, Sociologist, Institute of Behavioral Science - University of Colorado Boulder

Co-Author(s):
Chris Barth (Fire Mitigation Specialist, Bureau of Land Management)
Lilia Falk (Director, West Region Wildfire Council)
Pam Froemke (IT & GIS Specialist, U.S. Forest Service, Rocky Mountain Research Station)
Jaime Gomez (Mitigation & Education Coordinator, West Region Wildfire Council)
James Meldrum (Economist, Fort Collins Science Center, U.S. Geological Survey)
Pam Wilson (Executive Director, FireWise of Southwest Colorado)

While wildfire is a natural phenomenon, community adaptation to wildfire is a social phenomenon. The Wildfire Research Team (WiRē) is a unique, interdisciplinary researcher-practitioner collaboration that collects and analyzes local biophysical and social data with the goal of helping communities adapt to wildfire. The researchers and practitioners work together closely to ensure that the community-specific data and analyses inform and become an important part of community wildfire programs that support local solutions to the wildfire issue. The data and analyses allow the wildfire mitigation practitioners to move beyond anecdotes and opinions of the select individuals that may participate in community efforts to a more comprehensive understanding of the social dynamics within the entire community. The practitioners use the community-specific social science to tailor their community education efforts and develop more effective programs. Further, the systematic approach to data collection across varied communities has allowed the WiRē team to start untangling community-specific social issues from social issues that transcend jurisdictional boundaries. Finally, the data and analyses have contributed to the wildfire social science literature both on its own and as it links to the work of other researchers in the field.

Keywords: practitioner-researcher collaboration, adaptation, program improvement, social science

Bio: Patty Champ is a research economist with the U.S. Forest Service, Rocky Mountain Research Station in Fort Collins, CO. Her experience in nonmarket valuation sparked her interest in wildfire social science. Over the years she has developed a research agenda focusing on three aspects of wildfire: the economic costs of exposure to wildfire smoke, wildland-urban interface homeowners' perceptions of risk and risk mitigating behaviors and the effects of wildfire risk on home sales prices.

Hannah Brenkert-Smith is an environmental sociologist with the Institute of Behavioral Science at the University of Colorado Boulder. She has been working on wildfire social science

since 2003, focusing on various aspects of decision-making in the face of environmental hazards including homeowner risk mitigation behaviors, informal social interactions, and community narratives. Her recent work includes inquiry into stakeholder notions of fire adaptation and explores contested notions of resilient forest landscapes in cross-boundary management dilemmas.

35. Wildfire Smoke: A Guide for Public Health Officials 2016/2017Revisions

Presenter: Paul Garbe, Branch Chief, Air Pollution and Respiratory Health, Centers for Disease Control and Prevention, National Center for Environmental Health

Co-Author(s):
Susan Lyon Stone, MS, Senior Environmental Health Scientist, US Environmental Protection Agency
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Scott Damon, Health Communications Specialist, Air Pollution and Respiratory Health Branch, US Centers for Disease Control and Prevention (CDC)
Peter Lahm, Fire and Aviation Management, Washington Office, US Forest Service
Dr. Susan O'Neill, Pacific Northwest Research Station, Forest Service, AirFire Team
Corey Butler, Western States Division, National Institute for Occupational Safety and Health, CDC
Dr. Marissa Hauptman, Pediatric Environmental Health Specialty Unit (PEHSU)

This presentation will describe revisions included in the 2016 draft document Wildfire Smoke: A Guide for Public Health Officials, describe ways improved information was used in 2016 fire season and discuss the final version of the guide that will be available in mid-2017. The Guide, which was last revised in 2008, is designed to help local public health officials prepare for smoke events, to take measures to protect the public when smoke is present, and communicate with the public about wildfire smoke and health. The draft has been updated with the assistance and expertise from a number of federal and state agencies. Significant revisions to the document include: updated information about the health effects of smoke and at-risk populations; evidence-based strategies to reduce smoke exposure; the latest recommendations from National Institute of Occupational Safety and Health (NIOSH) about respirator use; new tools on the AirNow website and an improved visual range index; updated actions for public health officials; and information about a new program to improve responses to fire/smoke events. The Appendices include new guidelines for ash clean-up from NIOSH and fact sheets written by pediatricians about protecting children during smoke events.

Keywords: Health Effects of Smoke, Emergency Response, Public Health Guidelines, Air Quality Index (AQI), Visual Range

Bio: Dr. Garbe directs CDC's National Asthma Control Program, which supports 25 state health departments for comprehensive asthma control activities. Dr. Garbe leads CDC efforts to

assist states health departments with public health response to air pollution exposures, including wildland fire smoke exposures.

36. Utilizing Risk Data to Catalyze Local Action
Presenter: Nathan Barrons, Catastrophic Wildfire Reduction Strategy Coordinator, State of Utah Division of Forestry, Fire and State Lands

In 2016 the State of Utah's Division of Forestry and Fire and State Lands (FFSL) completed the initial version of the Utah Wildfire Risk Assessment Portal (UWRAP). This web portal displays data from the West Wide Wildfire Risk Assessment (WWA) that has been optimized for local projection. Working with State legislators, FFSL passed two bills in 2016 that restructure wildfire policy within the state and how FFSL, counties and municipalities share the cost of wildfire suppression. Using the wildfire threat raster data associated with the WWA, FFSL is assessing communities a dollar value based on acreage at risk. Based on the assessed value, participating communities are then expected to perform mitigation and prevention actions to the level of their assessment on an annual basis.

This program in Utah is an example of data driven decision making. Using data to support subject matter experts decision and point the boat in the proper direction, whether it be to implement vegetation treatments, reach communities with high fire occurrence rates, or support increased suppression capacity within communities. Furthermore the way in which the data is being leveraged within this program catalyzes community action at both the municipal and county level to be proactive as opposed to strictly reactive to the challenges associated with wildfire in Utah.

Keywords: Data based decision making, risk mapping

Bio: Nate has worked in wildfire management for 16 years at both the federal and state level in a variety of roles, from suppression hand-crew member, squad boss and crew supervisor, to fuels planner and state wide coordinator for Utah. A graduate of both the University of Oregon and Portland State University, Nate also has a background in geo-spatial science with an emphasis on natural resource applications.

37. Improved Simulation of Probabilistic Wildfire Risk Components for the Conterminous United States
Presenter: Karen Short, USDA Forest Service, Rocky Mountain Research Station

Co-Author(s):
Mark A. Finney, Research Forester, USDA Forest Service, Rocky Mountain Research Station
Joe H. Scott, Principal Consultant, Pyrologix LLC
Julie W. Gilbertson-Day, Spatial Wildfire Analyst, Pryologix LLC
Isaac C. Grenfell, Mathematician, USDA Forest Service, Rocky Mountain Research Station

A national-scale assessment of wildfire risk offers a consistent means of understanding and comparing threats to valued resources and predicting and prioritizing investments in management activities that mitigate those risks. We used a simulation system to estimate the probabilistic components of wildfire risk for 128 distinct regions of contemporary wildfire activity (pyromes) across the conterminous US (CONUS). The system, called FSim, consists of modules for weather generation, and for modeling of large-fire occurrence, growth, and suppression. FSim is designed to simulate the occurrence and growth of fires under tens of thousands of hypothetical contemporary fire seasons in order to estimate burn probabilities and conditional flame lengths at multiple spatial scales, given current landscape conditions and fire management policies. These outputs have been generated for the CONUS in each of five consecutive years to support a number of planning and risk assessment efforts. Here we (1) describe changes to the system and to the input and reference data used over this period that have improved our ability to characterize outcomes of spatially explicit ignitions under conditions conducive to large fire development across the CONUS; and (2) present the most recently generated wall-to-wall (i.e., 'all-lands') products, which are publicly available from the US Forest Service Research Data Archive: https://www.fs.usda.gov/rds/archive/Product/RDS-2016-0034/.

Keywords: risk assessment, wildfire hazard, burn probability

Bio: Karen Short is a Research Ecologist with the USDA Forest Service, Rocky Mountain Research Station, Human Dimensions program. She received her BSc in Wildlife and Fisheries Science from the University of Arizona and her PhD in Organismal Biology and Ecolo

38. Strategic-level Decision Support for Aviation Use in Large Fire Suppression
Presenter: Christopher O'Connor, Ecologist, US Forest Service Rocky Mountain Research Station

Co-Author(s):
Crystal Stonesifer, Ecologist, USDA Forest Service/ Rocky Mountain Research Station
Dave Calkin, Research Forester, USDA Forest Service, Rocky Mountain Research Station
Matthew Thompson, Research Forester, USDA Forest Service, Rocky Mountain Research Station

In recent years, the US Forest Service annual operating budget has faced increasing pressure from rising wildfire suppression expenditures. Simultaneously, Agency efforts are underway to embrace a new risk management paradigm, to empower firefighters at all levels to prioritize personal safety over other fire management objectives. As the Agency moves forward with systemic changes aimed at improved efficiency and risk mitigation in fire management, the need to better document suppression actions and outcomes to support a learning organization is becoming more apparent. This is particularly true for aviation resources, which account for a large proportion of risk and expenses in wildfire suppression. However, despite the significant role aircraft have with respect to risk and cost, current data collection systems preclude analyses or summaries of operational use and outcomes. Further, real-time analytics and

decision support tools targeted at both efficient aviation use and addressing risk transfer between ground and aviation resources are not widely available. Related to this theme, we will highlight the current state of data collection and research related to aviation use in US fire suppression, illustrating problematic holes in Federal data-collection efforts that lead to challenges summarizing aviation actions and outcomes. We will then present a hypothetical framework for enhanced real-time data collection and documentation efforts aimed at informed decision-making during large fire management regarding aviation use. Future implementation of this framework would greatly improve managers' abilities to 1) recreate what actually occurred on an incident from an operational-scale, 2) document where tactical objectives were successful and where aerial actions saw limited effectiveness, and 3) utilize real-time analytics to assist managers in strategic decision-making incorporating risk management and efficiency principles.

Keywords: decision-support, risk management, efficiency, aviation

Bio: I am an ecologist with the USFS Rocky Mountain Research Station Wildfire Risk Management Team in Missoula, Montana. I am currently working on risk-based tools to support integrating operational fire management with sustainable landscape planning, fire responder safety, and efficient use of suppression resources. I enjoy developing research products and translating them into usable tools to be tested by landscape managers. My research focus on disturbance ecology draws from a methodological background in forest ecology, fire science, dendrochronology, spatial analysis and modeling and ecological risk assessment. I have a B.S. from Penn State University, an M.S. from the University of Quebec, and a PhD from the University of Arizona.

39. Archetypes of Community Exposure to Wildfire from Western National Forests.
Presenter: Cody Evers, PhD Student, Portland State University

Co-Author(s):
Alan Ager, Research Forester, RMRS, USDA Forest Service
Max Nielsen-Pincus, Assistant Professor, Portland State University
Palaiologou Palaiologos, J-1 Exchange Visitor Program, USDA Forest Service

Fire policy of the United States emphasizes the importance of fire-adapted communities. Yet learning to "live with fire" will require that communities conform to the fire ecology of the region. The diversity of "pyromes" in the Western US means that the same approach to adaptation is unlikely to be appropriate for all communities. One approach to assessing the adaptation strategies needed is to look at the distinct types of community exposure to wildfire. In areas like the Western US, where fires can travel dozens of miles, it is critical that such an approach consider the scale and mechanism by which wildfire exposure occurs. In this presentation, we present a framework for characterizing wildfire exposure communities from surrounding public lands in the Western US. We estimate annual wildfire exposure from USFS lands for 5200 communities within 11 states of the western US including large fires. We decompose transmission and exposure of simulated fires coming from National Forests (NF)

for several thousand fire seasons. We identify several common types of community exposure and discuss risk mitigation strategies appropriate for each. Using this typology, our research provides insights on conflicts and opportunities to co-manage fire in shared landscapes. Adaptation to wildfire, especially under a change climate, will require flexible strategies tailored to local context. Focusing analysis on wildfire risk on communities emphasizes the places that people identify with and may allow leveraging local community capacity for adaptation.

Keywords: Wildfire exposure; Wildfire transmission; Community archetypes; Wildfire modeling

Bio: Cody Evers is a PhD student in the Department of Environmental Science and Management at Portland State University. He has been involved in research on wildfire management for close to a decade.

40. Linking Operational Fire Management Opportunities to Landscape Planning Objectives
Presenter: Christopher O'Connor, Ecologist, US Forest Service Rocky Mountain Research Station

Co-Author(s):
David E. Calkin, Research Forester, US Forest Service Rocky Mountain Research Station
Jessica R. Haas, Ecologist, US Forest Service Rocky Mountain Research Station
Matthew P. Thompson, Research Forester, US Forest Service Rocky Mountain Research Station

How can the operational response to wildfire promote and ensure the restoring and maintaining of resilient landscapes and creation of fire-adapted communities while still protecting life, assets, and natural resources? We attempt to address this question with a new approach that brings together a spatial model of suppression opportunities and challenges developed from past fire perimeters, with a probabilistic assessment of the potential hazards and benefits of wildfire to natural resources and human assets across a landscape. The method draws on several new research products applied through a series of hands-on engagements with fire staff, line officers, and resource specialists on a managed forest landscape. We use the Tonto National Forest and surrounding ownerships in central Arizona as a case study to develop an integrated spatial fire plan. We worked directly with fire managers to develop a network of operational fire containers from modeled suppression opportunities; and then applied this network to a wildfire risk assessment informed by local resource specialists and line officers. The resulting risk-based spatial fire planning product reflects science-informed decision making that can be used to coordinate fire response across ownerships, to communicate fire management objectives to out-of-area incident management teams, and to inform the public during on-going fire operations. Integrating wildfire risk across a landscape with operational fire response is designed to highlight opportunities for managed fire, pre-identify hazards to fire responder and public safety, and align short-term fire management and long-term landscape management objectives.

Keywords: fire risk, management opportunities, spatial fire planning

Bio: I am an ecologist with the USFS Rocky Mountain Research Station Wildfire Risk Management Team in Missoula, Montana. I am currently working on risk-based tools to support integrating operational fire management with sustainable landscape planning, fire responder safety, and efficient use of suppression resources. I enjoy developing research products and translating them into usable tools to be tested by landscape managers. My research focus on disturbance ecology draws from a methodological background in forest ecology, fire science, dendrochronology, spatial analysis and modeling and ecological risk assessment. I have a B.S. from Penn State University, an M.S. from the University of Quebec, and a PhD from the University of Arizona.

41. Fire Science Informing Fire Management: the US Geological Survey (continued)
Presenter: Paul Steblein, Fire Science Coordinator, US Geological Survey, Ecosystems

Science is fundamental to the National Cohesive Wildland Fire Management Strategy of the United States. Now more than ever, it is imperative that best available science be used to inform newly developed fire management policies and planning efforts. The proposed session will provide examples of manager-scientist collaborations that resulted in the timely integration of best available science into important management and conservation decisions. These examples will include various spatial scales, geographic regions, short and long-term issues, and various agencies/stakeholder types. They will highlight partnerships among agencies of the Department of the Interior, including the US Geological Survey which is charged primarily with providing relevant science in support of federal lands management. Examples will also illustrate how US Geological Survey fire science supports the broader needs of society. The session will utilize a tag team approach with a USGS "scientist" describing the science need and how the end-products were developed and a "manager" explaining how the science products were used to solve a problem or better address an issue. Additionally, the session will consist of opening and closing talks to setup and summarize the relationships and processes among these successful collaborations.

Assessing the Risk of Wildfire to Sage-Grouse Populations
Presenters: Coates, P. S.[1], M. A. Ricca[1], B. G. Prochazka[1], M. L. Brooks[1], K. E. Doherty[2], E. J. Blomberg[3], C. A. Hagen[4], M. L. Casazza[1], and P. Deibert[2]

[1]U.S. Geological Survey
[2]U.S. Fish and Wildlife Service
[3]University of Maine
[4]Oregon State University

Iconic sagebrush ecosystems are threatened by larger and more frequent wildfires that can kill sagebrush and facilitate invasion by annual grasses, thereby creating a cycle that continually alters sagebrush ecosystem recovery after disturbance. Scientific findings that focused on

long-lasting effects of wildfire on greater sage-grouse (*Centrocercus urophasianus*) populations was needed to help inform a listing decision by the U.S. Fish and Wildlife Service (FWS) under Endangered Species Act. Here, we first describe patterns of wildfire area, size, rotation, and season length over three decades across sage-grouse range. We then focused modeling wildfire and climatic effects on population growth rates within the Great Basin, which consisted of portions of western management zones, while considering ecosystem resilience to disturbance and resistance to invasion by exotic plant species. Model results indicate that if wildfire trends continue unabated, populations of sage-grouse will be reduced to approximately half of their current numbers over the next three decades. Long-lasting effects from wildfire nullified pulses of population growth that typically follow years of relatively high precipitation. We identified important areas to focus management actions and used scenario-based stochastic projections to inform targeted reductions in the rate of sagebrush loss from wildlife. Not only were these findings important to the species status assessment by FWS, but provided timely and critical information for prevention, management, and restoration of wildland fires (Secretarial Order 333).

Science Management Partnerships Reduce Vulnerability of Southwestern Cultural Landscapes Before, During and After Wildfires

Presenters: Rachel Loehman, Research Landscape Ecologist, U.S. Geological Survey, Alaska Science Center
Dennis Carril, Fire Ecology/Fuels, US Forest Service, Santa Fe National Forest
Connie Constan, Assistant Zone Archaeologist, US Forest Service, Jemez and Cuba Ranger Districts, Santa Fe National Forest

How do fuels planners, fire ecologists, cultural resource managers, and tribes work together to protect archaeological resources in fire-prone landscapes? Because these resources are non-renewable, fire-caused damage to sites and artifacts constitutes a permanent loss of knowledge, with cultural (these resources link native peoples to their ancestors and to the landscape), legal (the National Historic Preservation Act [NHPA 1966, Section 106] directs land managers to account for potential or actual wildfire damage to cultural resources), and economic (archaeological monuments and sites are highly visited by the public) consequences. Past management, climate changes, and other factors have resulted in a dramatic increase in wildfire severity, size, frequency, and impact across much of the western U.S. Shifts toward more frequent, larger, and more severe wildfires are likely to continue with warming temperatures and drier landscapes, resulting in fire patterns that are outside of the historical range and that have the potential to alter, disturb, or destroy cultural resources. Collaborations among archaeologists, ecologists, fire managers, and tribes can help mitigate wildfire risk while also avoiding or minimizing risks of impacts from fuel treatments and prescribed fire. We report on new knowledge about fuel loads and fire environments that may cause untenable alteration of prehistoric artifacts and sites, operational fire strategies that minimize unwanted fire effects, and post-fire processes that may indirectly alter the integrity of prehistoric sites. This information was produced through a science-management collaborative project among fire scientists, ecologists, cultural resources managers, and tribal liaisons, and improves protection of cultural resources before, during, and after wildfires and prescribed fires.10:55-

11:15 Hazard reduction associated with flooding, sedimentation and debris-flow events following wildfires

Bio: Dr. Loehman began her career as an archaeologist in the southwestern US, with particular interest in human-environment interactions. Later, as an ecosystems and fire ecologist, she continued to study coupled-human natural systems; for example, human influences on fire regimes and ecosystem processes. This includes work on the impacts of fires on archaeological resources, of critical importance as increased, high-severity fires threaten to irrevocably alter prehistoric cultural records. Dr. Loehman collaborates regularly with resource managers, who are key partners in research on climate and fire dynamics, and works in ecosystems from the southwestern US to boreal Alaska.

Understanding and Applying Diverse Fire Histories and Ecologies in Northern New Mexico
Presenters: Collin Haffey, Ecologist, U.S. Geological Survey, Fort Collins Science Center, New Mexico Landscapes Field Station
Dennis Carril, Fire Ecologist, U.S. Forest Service, Santa Fe National Forest

Co-Authors: Craig D. Allen and Ellis Q. Margolis, Research Ecologists, U.S. Geological Survey, Fort Collins Science Center, New Mexico Landscapes Field Station

Forest and woodland landscapes of northern New Mexico encompass extreme gradients of geology, landform, elevation, climate, vegetation, and human cultures and land use histories. Spanning lower treeline juniper savannas at ~5500′ to upper treeline forests of spruce-fir at ~12,000′, this landscape diversity drives a spectrum of place-specific fire ecologies, histories, and effects. For 30 years, the U.S. Department of Interior has been a consistent research presence in northern New Mexico studying the landscape ecology, including a strong focus on fire. Formalized as a USGS Field Station in 1993 we are working to develop a second generation of USGS place-base scientists. Working collaboratively with a broad array of land managers and scientists, collectively we have highlighted the importance of fire as a vital ecosystem process across ecological gradients in northern New Mexico landscapes.
Northern New Mexico has experienced the dramatic effects of climate change, including catastrophic megafires, as much as any other location in the country. As we move into an uncertain future, science and management partnerships are more important than ever. Our research has highlighted that fire is a keystone ecological process missing from dry conifer forests of the Southwest. The challenges related to the reintroduction of fire are enormous. The main logistical concerns include personnel capacity, budget constraints, and legal compliance. Operational concerns are related to risks associated with fire management, especially the possibility of fire escape. Additionally, smoke regulations favor less burning and more restrictive guidelines. Public acceptance of large-scale wildfire use is a promising opportunity for reintroducing fire to dry conifer forests. A new fire culture is imperative, with the acceptance of smoke and practical implementation policy, supported by responsive, place-based science that can be efficiently rolled into local, regional, and national fire management

policies.11:35-11:55 Paradigm shift leads to more effective fire management in southern California shrublands

Bio: Collin Haffey is an ecologist with the U.S. Geological Survey, and a member of the New Mexico Landscapes Field Station in northern New Mexico, where he works as a place-based ecologist, co-located with land managers. Collin's recent work includes a focus on climate-related forest disturbance processes, ranging from drought- and fire-induced ecosystem type conversion from forests to shrublands or grasslands at local and regional scales. He is currently co-organizing a large collaborative climate change adaption project in the Jemez Mountains.

Dennis Carril has a Master's degree from Southern Illinois University where he studied the fire ecology of mid-western oak-history forests. He has worked for the U.S. Forest Service for over a decade in the wildland fire program. In recent years, Dennis has served as the fire ecologist for the Santa Fe National Forests, where he works to re-introduce fire to over a million acres of dry-conifer forest in northern New Mexico. In 2014, Dennis managed a lightning sparked wildfire in the Jemez Mountains that was later named the "Incident of the Year" by the Southwest Fire Science Consortium.

Prescribed Fire Research in the Sierra Nevada and Beyond: NPS-USGS Partnerships to Restore a Natural Process to Western Forests
Presenters: Phil van Mantgem, Research Ecologist, US Geological Survey, Western Ecological Research Center, Redwood Field Station, Arcata, Ca
Calvin Farris, Fire Ecologist, National Park Service, South Cascades Network, Klamath Falls, OR

Following more than a century of fire exclusion in the coniferous forests in California, fuels have accumulated to hazardous levels in forests that historically burned at high frequencies. Moreover, there was a recognition that some iconic species, such as giant sequoia, are dependent on fire to maintain viable populations. The National Park Service was an early adopter of using prescribed fire to restore this natural process, with the intension of reducing fuels hazards and promoting fire-adapted species. There were (and still are) many unknowns concerning the use of prescribed fire, including basic information as when, where, and how frequently to use fire. USGS has had a relatively long history of conducting place-based research at in national parks, helping to meet these research needs. We highlight several successful NPS-USGS partnerships in the Sierra Nevada and Klamath mountains that have refined our understanding of prescribed fire in western parks. These partnerships are forward-looking, helping to identify the role prescribed fire might play in creating forests that are resistant and resilient to future disturbances. Follow-up from session – we also propose a set of papers from the session will be published in a peer reviewed journal (e.g., BioScience).

Bio: Phil van Mantgem is a Research Ecologist with the US Geological Survey, co-located with Redwood National Park. Dr. van Mantgem's research interests include forest dynamics, fire

ecology, and the management of forested ecosystems. He has been studying (and enjoying) forests in the western US since 1995.

Fire Science Information: How Much is Enough for Federal Fire Management?
Presenters: Matthew Brooks, Supervisory Research Ecologist, U.S. Geological Survey, Western Ecological Research Center
Karen Prentice, National Healthy Landscapes Coordinator and Acting National Science Advisor, Bureau of Land Management, Washington D.C.

Science is one of diverse factors that land managers consider when establishing objectives, considering trade-offs, and making decisions. In addition to science, other factors include professional experience, aesthetic and moral judgements, political and financial realities, and regulatory, administrative, and other requirements. To provide independent and objective assessments, science must be evaluated separately from these other factors. However, in application science must be combined with these other factors in the decision-making process. These management decisions reflect the information at hand when the decision is made. In the case of science, this typically includes information that spans a range of confidence in truth and accuracy of findings. This begs the question, how much fire science is needed, and how reliable does that science need to be, to make management decisions? The answer begins with an understanding that science is a body of knowledge resulting from a process defined as the systematic study of the world through observations which lead to potential explanations (hypotheses) that are evaluated through experiments, systematic observations, and associated quantitative data evaluated statistically including estimates of error and reliability. The process of science is continuous, through which hypotheses are developed, tested, revised, and tested again. As repeated, consistent results increase confidence in some aspect of the natural world they may be synthesized into scientific theory, and ultimately scientific law. Each level represents increased scientific confidence and proximity to the truth. Professional knowledge and qualitative observations are part of the scientific process, but do not alone constitute science. BLM's National Science Committee promotes the integration of science into land management decisions and endeavors to enhance employee access to science support tools. The Committee has found that there is no fixed answer to the question, "How much highly reliable science is enough?" It recommends that managers should determine the amount of relevant science available to inform a management decision, consider and document assumptions and uncertainties (i.e., reliability) of the science, evaluate the level of scrutiny and degree of supporting documentation that a decision may elicit and require, and effectively communicate how science was used in the decision-making processes.

Questions on proposals should be sent to:
Paul Steblein, USGS Fire Science Coordinator, psteblein@usgs.gov or 703-648-6895;
Matt Brooks, Supervisory Research Ecologist, matt_brooks@usgs.gov or 559-240-7622
Science is fundamental to the National Cohesive Wildland Fire Management Strategy of the United States. Now more than ever, it is imperative that best available science be used to inform newly developed fire management policies and planning efforts. The proposed session will provide examples of manager-scientist collaborations that resulted in the timely

integration of best available science into important management and conservation decisions. These examples will include various spatial scales, geographic regions, short and long-term issues, and various agencies/stakeholder types. They will highlight partnerships among agencies of the Department of the Interior, including the US Geological Survey which is charged primarily with providing relevant science in support of federal lands management. Examples will also illustrate how US Geological Survey fire science supports the broader needs of society. The session will utilize a tag team approach with a USGS "scientist" describing the science need and how the end-products were developed and a "manager" explaining how the science products were used to solve a problem or better address an issue. Additionally, the session will consist of opening and closing talks to setup and summarize the relationships and processes among these successful collaborations.

Bio: Dr. Brooks grew up exploring the landscapes and lifeforms of southwestern North America with his family, and has continued that tradition since the late 1980s as a professional research scientist. His work has focused on the ecology and management of fire, invasive species, and land uses in desert ecoregions. During the past decade, he added studies in the Sierra Nevada involving wildlife, carbon stocks, and meadow dynamics. His research model incorporates land managers as key members of research teams from proposal to publication. This model facilitates development and integration of relevant science into land management policy and plans.

After building a solid foundation of field skills conducting baseline botanical assessments and post-reclamation monitoring throughout the west, Karen worked with Nevada communities to address grazing management, invasive plants, flooding, and post-fire management concerns. Addressing these issues necessitated working across boundaries to build relationships, shared understanding of condition and management opportunities, and capacity to work collaboratively across these management topics. Currently, she addresses these same issues from BLM's national office.

42. Co-management of Wildfire on Public Rangelands: Rangeland Fire Protection Associations

Presenter: Amanda Stasiewicz, Ph.D. Student and Graduate Research Assistant, Department of Natural Resources and Society, College of Natural Resources, University of Idaho

Co-Author(s):
Travis B. Paveglio, Ph.D., Assistant Professor, Department of Natural Resources and Society, College of Natural Resources, University of Idaho

The increasing size and frequency of rangeland wildfires poses a growing threat to rangeland ecosystems and private property. The state of Idaho recently promoted rangeland fire protection associations (RFPAs)nonprofit organizations comprised of local private citizens who contribute to fire suppression efforts on public rangelandsas one way to mitigate rangeland wildfire risk. Eight RFPAs have been established in Idaho since summer 2012, and each

operates in a unique social and ecological context that may influence the way that RFPAs integrate into rangeland wildfire management. We conducted interviews with RFPA members and land or fire management professionals who interfaced with the Black Canyon RFPA (BCRFPA) in southwestern Idaho. Our goal was to investigate how an RFPA operates in a more complex environment characterized by: (1) close proximity or overlap with the wildland-urban interface (WUI), (2) fragmentation of different land ownerships and uses; and (3) multiple public agency and land management collaborators contributing to rangeland fire suppression efforts. BCRFPA members compared themselves to other RFPAs in the state and suggested that they filled a comparatively different role in wildfire management, especially when compared to more remote RFPAs that operated as more autonomous fire suppression groups. Members of nearby rural fire districts were initially apprehensive about the formation of the BCRFPA due to concerns about competing for funding and excess federal equipment. RFPA members who had professional firefighting experience played an important role in alleviating RFD's concerns and explaining how the RFPA would integrate into the wildfire management big picture. The BCRFPA provides initial attack, local knowledge about roads and water resources, and privately-owned equipment to wildfire suppression efforts on or adjacent to public lands. They also help partners with structure protection responsibilities because enhancing collective ability to keep rangeland wildfires smaller and out of the wildland-urban interface serves common goals across landownerships. We conclude by discussing conditions that might enable or inhibit RFPA establishment and functioning in other rangeland areas and suggest how our findings can advance research on adapting mitigation programs to specific social and ecological contexts.

Keywords: wildfire co-management, Rangeland Fire Protection Associations

Bio: Amanda is a Ph.D. student in the Department of Natural Resources and Society in the College of Natural Resources at the University of Idaho. Her M.S. research explored tools for mitigating wildfire risk in resource-dependent communities in Idaho. Amanda's dissertation research focuses on human populations' variable support for and adoption of strategies for creating fire-adapted communities. Her dissertation efforts span communities across the U.S. West, with a focus on the Pacific Northwest.

43. Social Science To Support Forest Restoration Across All Lands

Presenter: Susan Charnley, Research Social Scientist, USDA Forest Service, Pacific Northwest Research Station

Co-Author(s):
Dr. Erin Kelly, Assistant Professor, Dept. of Forestry and Wildland Resources, Humboldt State University
Jodie Pixley, Graduate Student, Dept. of Forestry and Wildland Resources, Humboldt State University

Over the last decade, the all hands, all lands approach has gained prominence as a means for restoring resilient forests and grasslands. When implemented on the ground, the all hands, all

lands approach means that land owners, managers, and stakeholders with management interests in a shared landscape jointly plan and/or implement forest management activities to achieve common goals. Ideally, best available science is integrated into all lands projects in order to strategically place restoration treatments across land ownerships to optimize desired outcomes. However, science-based restoration treatments in multi-ownership landscapes will only be successful if they are socially feasible. Implementing an all lands approach is challenging because it requires land owners, managers, and stakeholders with diverse interests, management approaches, and capacities to act collectively.
This talk draws on case-study research from three all lands projects located in Oregon and California that sought to identify the social factors influencing the success (or lack thereof) of these projects for reducing wildfire risk. The projects are now part of the Forest ServiceNatural Resources Conservation Service Chiefs' Joint Landscape Restoration Partnership. While each of the projects demonstrated unique strategies for all lands approaches, we found some consistent social factors influencing success including: federal policy direction and funding to support restoration on multiple land ownerships; strategic partnerships that helped leverage funding and technical expertise; common acknowledgment among partners of the existing wildfire threat; strong pre-existing working relationships between partners; intermediary organizations to help facilitate and provide capacity for doing the work; strong local outreach to private landowners; clear, consistent, frequent communication among all partners; and local business capacity for implementing treatments. We address how social factors enabling or constraining collective action for all lands approaches to forest restoration differed by landowner type (federal, state, private). We also share our thoughts on how to improve integration of science into all lands projects.

Keywords: all lands approaches, wildfire mitigation, social science, Joint Chiefs Landscape Restoration Partnership

Bio: Susan Charnley is a Research Social Scientist with the U.S. Forest Service, Pacific Northwest Research Station, based in Portland, OR. Her field is environmental anthropology. Her research aims to improve understanding of how to integrate rural community well-being with ecosystem health. Her research interests are socioeconomic monitoring and assessment, rural community sustainability, community-based natural resource management, and interacting human and ecological systems. Susan works in the western U.S. and in Africa.

44. Lessons Learned from the Insurance Industry: The Power of Incentives
Presenter: Rob Galbraith, Director of Property Underwriting, USAA

Research by USAA confirms that collective prevention efforts undertaken by homeowners in Firewise communities measurably reduce expected economic losses associated with wildfire. Based on this research, USAA has partnered with NFPA to be the first major national insurance provider who offers a discount to members in Firewise Communities. The discount has been well received by state and local fire officials, political leaders, and local community organizers involved in activities related to preventing, suppressing, and managing wildfire. In particular, fire responders within states like Arizona, California, Colorado, Oregon, and Texas have

promoted this financial incentive as yet another reason citizens who live in high-risk communities in the wildland urban interface (WUI) should strongly consider taking proactive steps to mitigate their exposure.
USAA will present their research behind our decision to offer this financial incentive and discuss how it has led to strong collaboration at the federal, state, and local level with fire officials. These partnerships have improved alliances between fire professionals, local community leaders, and USAA to speak with a unified voice in communicating risk to communities, educating homeowners on the benefits of mitigation, and inspiring them to take strong action to protect their homes against the threat of wildfire.
Finally, the presentation will touch on the escalating costs of wildfire suppression and how these inadvertently subsidize the cost of providing homeowners insurance in the WUI. By taking on these costs, agencies reduce the true economic and insurance losses that homeowners incur which in turn reduces the costs of insuring these properties. This unintentional subsidization may be sending the wrong economic signals to both homeowners and land use planners, spurring further development in WUI areas. If governmental agencies, land use planners, and insurance companies partner together to create a unified view of threat potential and values at risk, key stakeholders can collaborate more effectively towards implementing the goals of the Cohesive Strategy.

Keywords: insurance, incentives, protection, mitigation, suppression, values at risk

Bio: Rob Galbraith, CPCU, CLU, ChFC is a Director in the Property and Casualty (P&C) Property Underwriting area at USAA, where his team is responsible for developing and managing USAA's catastrophe underwriting guidelines for all property lines and perils, including wildfire. Rob has over 20 years of experience in the financial services industry in a variety of positions with USAA, Smith Barney, and the Federal Reserve Board. Rob has earned several industry professional designations and is actively involved as part of multiple industry trade groups.

45. Models, Maps and Meetings: Using Science to Guide CS Implementation in Northern NM

Presenter: Susan Rich, Forest and Watershed Health Coordinator, New Mexico Energy, Minerals and Natural Resources Department, Forestry Division and Steve Bassett, Spatial Analyst, The Nature Conservancy

Susan Rich and Steve Bassett will present a case study illustrating ways that science is being used to facilitate implementation of the Cohesive Strategy in Northern New Mexico.
Ms. Rich will give an overview describing examples of how science is enhancing collaborative efforts to create resilient landscapes, reduce risk to people and infrastructure through community engagement and action, and support fire response agencies in their work. Ms. Rich's presentation will explain how political, cultural and ecological conditions in New Mexico enabled the state to integrate the three tenets into existing programs; the impetus for, and benefits of, investing time and money into ˜doing the science'; and the evolution of collaborative groups and how they developed and used scientific analyses to guide their work and garner support for their efforts.

Mr. Bassett will provide a summary of the analytical techniques and tools used as the foundation of science-based collaborative strategies at several scales. A review of the concepts associated with landscape scale fire risk will be provided, followed by an in-depth walk-through of the steps taken to create these collaborative strategies. Mr. Bassett will present the approach taken to adapt a widely used risk assessment framework to reflect local views on relative importance and tradeoffs between values, and to incorporate post-fire threats, such as debris flow and erosion, into the risk assessment process. Lessons learned during the implementation of these assessment in three landscapes will be shared, including successful approaches to guide diverse stakeholders through the risk assessment and project prioritization process. Emphasis will be placed on risk assessments enable targeted cross-boundary investment in restoring landscape resilience, adaptation of WUI communities, and effective wildfire response.

Keywords: Case study, Science-based tools, Collaborative planning and implementation, Cross-jurisdictional

Bio: Susan Rich is the Forest and Watershed Health Coordinator for New Mexico State Forestry. Her career spans three decades working in natural resource management for local governments and conservation districts, as well as for the state. Susan works closely with partner agencies and organizations to implement New Mexico's Forest and Watershed Health Plan and Forest Action Plan, both of which provide a foundation for Cohesive Strategy actions. Susan leads the state's multi-entity Forest and Watershed Management Coordinating Group. She is a member of the Western Regional Strategy Committee and served two terms on the Southwest Fire Science Consortium Executive Board.

Steve Bassett is a spatial analyst for The Nature Conservancy. He supports science-based decision-making for the Rio Grande Water Fund and numerous collaborative landscape strategy groups.

46. Managed Fire as a Fuel Treatment

Presenter: Karin Riley, Research Ecologist, US Forest Service

Co-Author(s):
Matthew P. Thompson, Research Forester, Rocky Mountain Research Station, US Forest Service
Joe Scott, Owner, Pyrologix LLC
Julie Gilbertson-Day, Lead Analyst, Pyrologix LLC

Opportunities to perform mechanical fuel treatments are often highly constrained by factors such as budget, slope, distance from road, and land designation. Given that, the use of managed fire on the landscape might provide more opportunities to reduce fuels and accomplish landscape restoration goals. We chose the Sierra National Forest of California as a place to examine this premise. We identified pixels where mechanical treatment was feasible

based on the distance to road, slope, land designation, and potential to affect stand structure. Mechanical treatment was supported on only eight percent of pixels, further suggesting exploration of managed fire for fuel reduction. To investigate how fuel treatments and managed fire might affect risk to highly valued resources, we used a stochastic fire simulation program, FSim, to simulate burn probability, fire intensity, and generate an event set of fire perimeters. We examined six different fuel treatment scenarios and two different fire suppression policies: 1) business-as-usual (which equates to nearly full fire suppression on all policies), and 2) suppression on human-caused fires and no suppression on lightning-caused fires. Fuel treatments reduced burn probability and fire intensity, but effects were mainly confined to the immediate area in which the treatment occurred. Burn probabilities and fire sizes greatly increased under the second suppression scenario, but feedbacks in burned area were expected to limit the ignition and spread of additional fires within the first few years. Thus, we see the potential for using managed fire as a fuel treatment, especially since managed fire may be applied in areas where mechanical treatment is not feasible or allowed.

Keywords: fuel treatment; managed fire; fire simulation

Bio: Karin Riley is a Research Ecologist with the Rocky Mountain Research Station of the US Forest Service in Missoula, Montana. She received her PhD in Geosciences from the University of Montana in 2012. Karin serves as the Vice President of the Association for Fire Ecology and Associate Editor of the journal Fire Ecology. Currently, her work focuses on investigating how different fire suppression policies and fuel treatment scenarios might affect future burn probabilities.

47. Rethinking Performance Measurement in US Federal Wildland Fire Management
Presenter: Karen Short, Research Ecologist, USDA Forest Service, Rocky Mountain Research Station

Co-Author(s):
Matthew P. Thompson, Research Forester, USDA Forest Service, Rocky Mountain Research Station
David E. Calkin, Research Forester, USDA Forest Service, Rocky Mountain Research Station
Mark A. Finney, Research Forester, USDA Forest Service, Rocky Mountain Research Station
Isaac C. Grenfell, Mathematician, USDA Forest Service, Rocky Mountain Research Station

Initial attack (IA) success has long been one of the primary performance measures used by agencies with wildland firefighting responsibility in the United States (US) and elsewhere. The US federal agencies currently state that (1) they credit IA success when an ˜unwanted' wildfire is suppressed before it expands beyond 40 ha of forest or 121 ha of grass or brush, and (2) the US Forest Service and Department of Interior strive to achieve 98 and 95 percent IA success rates, respectively. Yet, as we explain here: (1) none of the agencies' fire-reporting or decision-support systems clearly distinguish ˜wanted' from ˜unwanted' wildfires; (2) environmental factors alone (e.g. weather, fuels, terrain) will tend to constrain the majority of wildfires to lt;121 ha, regardless of suppression activities; and (3) an emphasis on high IA success rates can

be counterproductive from long-term ecological and fire-management perspectives. The challenge is to develop alternative performance measures that are less ambiguous and that better align with risk management principles. We discuss risk-based performance measurement from the perspective of linking decisions to actions to outcomes, and offer recommendations for broad-scale, consistent metrics that can be aggregated at meaningful scales.

Keywords: preparedness, response, suppression, initial attack, effectiveness

Bio: Karen Short is a Research Ecologist with the USDA Forest Service, Rocky Mountain Research Station, Human Dimensions program. She received her BSc in Wildlife and Fisheries Science from the University of Arizona and her PhD in Organismal Biology and Ecology from the University of Montana. Her work has included fire-effects research in southwestern ponderosa pine forests; development and maintenance of spatial datasets on vegetation, fuels, and fire-occurrence for several national applications; and mapping of wildfire hazard for risk assessment and other applications. One product of this work is a spatial database of wildfires in the US, now spanning 1992-2013: http://www.earth-syst-sci-data.net/6/1/2014/essd-6-1-2014.html.

48. Fire Contagion and Effects across Mixed-Ownership Landscapes

Presenter: Christopher Dunn, Research Associate, College of Forestry, Oregon State University

Co-Author(s):
David E. Calkin, Rocky Mountain Research Station, US Forest Service, Missoula, MT, USA
Harold S.J. Zald, Forestry and Wildland Resources, Humboldt State University, Arcata, CA USA

Fuels are the only component of the fire triangle that forest and fire managers can alter to change fire behavior. There have been numerous studies examining how fuel reduction treatments and salvage logging alter fire behavior, severity, and its' ecological impacts. However, less attention has been paid to how different forest management objectives may influence fire severity in multi-owner landscapes, despite costly and politically contentious suppression of wildfires that do not acknowledge ownership boundaries. In 2013, the Douglas Complex burned over 20,000 of Oregon & California Railroad (O&C) lands in Southwestern Oregon, USA. The O&C lands are a geographic checkerboard of private industrial and federal forest land with fundamentally different management objectives, subsequent forest conditions, and perceived fire risks, providing a unique opportunity to quantify the effects of forest management practices on wildfire severity. We begin with an investigation into variations in fire ignition across these landscapes, followed by an evaluation of fire contagion across ownership boundaries. We follow by bringing together geospatial data on fire progression, fire weather, topography, pre-fire forest conditions derived from LiDAR, and past management activities to represent the different factors that influence fire behavior. Using ensemble machine learning and statistical modelling techniques, we disentangled the relative importance of these factors on fire severity. While daily fire weather strongly influenced fire

extent (area burned), ownership was the most important driver of fire severity, with younger and structurally homogeneous stands on private industrial forests displaying higher fire severity compared to older and structurally complex forests on federal lands.

Keywords: mixed-ownership; fire effects; fire severity; fire contagion

Bio: Chris Dunn is a Research Associate in the College of Forestry at Oregon State University. His scientific research has largely focused on fire ecology and post-fire effects, but he has recently transitioned back to his fire suppression and management background and is now investigating large wildfire management safety and effectiveness with the Human Dimensions Program at the Rocky Mountain Research Station in Missoula, Montana.

49. Western Klamath Restoration Partnership: Traditional and Contemporary Knowledge, Collaborative Engagement, and Early Implementation

Presenter: Bill Tripp, Deputy Director of Eco-Cultural Revitalization, Karuk Tribe
Will Harling, Director, Mid-Klamath Watershed Council
Dr. Arielle Halpern, Coordinator, Western Klamath Restoration Partnership

The Western Klamath Restoration Partnership (WKRP) published a plan in 2014, and immediately responded to a request from USDA Forest Service Region Five for collaborative projects that address the three goals of the Cohesive Strategy. Federal, tribal, state, NGO and individual stakeholders came together through a series of workshops to define shared values, identify threats to these values, and develop strategies that turn these threats into opportunities for action. This work, structured through the Open Standards Process for Conservation with support from the US Fire Learning Network, highlights what implementation of the Cohesive Strategy can mean in the Western Klamath Mountains and beyond.

The 60 minute panel presentation will lead off with Bill Tripp discussing Traditional Ecological Knowledge (TEK), practice and belief pathways, and how this is being integrated into WKRP and related collaborative outcomes. Dr. Arielle Halpern will discuss her participation in the Karuk/UC Berkeley Collaborative, TEK/Western Science integration, the details of her traditional foods and fire use studies, and obstacles of community based fire research. Will Harling will conclude with a presentation on the WKRP collaborative process, shared values, and early implementation efforts including the Klamath River Prescribed Fire Training Exchange (TREX) and National Fish and Wildlife Foundation projects currently underway. These presentations are approximately 20 minutes each, with a short question and answer period at the end of the session. If there is time, we propose showing the video short titled West Simms: A Burn Story (https://www.youtube.com/watch?v=Eld94suM4bg) (5 min run time).

Keywords: Collaborative Engagement, Fire Management, Traditional Ecological Knowledge, Klamath Mountains

Bio: Bill Tripp is Co-Chair of the Western Regional Strategy Committee, Co-Lead for the Western Klamath Restoration Partnership and Western Klamath Mountains Fire Learning Network, and leads the Karuk Hub for the Fire Adapted Communities Learning Network. He serves on the Northwest California Fire Science Consortium and Northern California Prescribed Fire Council steering committees. Bill is also a member of the Karuk Resource Advisory Board, advisor to the Indigenous Peoples Burning Network, and founds his responsibility in the knowledge of his elders, their expressions in his youth, and the experience gained as a traditional fire practitioner in a contemporary world.

50. Rekindling Tribal Fire Use: A Synthesis of Science for the Pacific Northwest
Presenter: Jonathan Long, Ecologist, USDA Forest Service, Pacific Northwest Research Station

Co-Author(s):
Frank K. Lake, Ecologist, USDA Pacific Southwest Research Station

Fire is a critical element in managing forest ecosystems within the Pacific Northwest, and particularly for promoting ecocultural resources of importance to tribes. Managers of national forests in California, Oregon, and Washington requested a science synthesis to help guide the revision of forest plans in the Sierra Nevada of California and the Northwest Forest Plan area of the Pacific Northwest. The Northwest Forest Plan did not emphasize the importance using fire manage to promote resources of value to tribes, or incorporation of tribal management practices. However, subsequent reports that monitored effects of the Plan's implementation have devoted increasing attention to whether tribes had access to forest species, resources, and places that were important for cultural, subsistence, or economic reasons, particularly those identified in treaties. These reports, bolstered by a numerous scientific publications, have highlighted the importance of managing fire to sustain not only the biophysical condition of resources but also the opportunities for tribes to have direct roles in using, restoring, and cultivating those resources on their ancestral lands throughout the Pacific West. This presentation will highlight findings from the science synthesis that explain the importance of restoring fire regimes to promote ecological resilience to future disturbances and to promote the social resilience of tribal communities by sustain ecocultural resources and traditions important to tribes. It will also feature several current examples of efforts to fulfill these opportunities and challenges, including particular attention to managing oak stands and forest openings that support important understory plants. The session will therefore highlight how emerging science and recent collaborations, including understanding and application of tribal traditional practices, are supporting implementation of the Cohesive Strategy.

Keywords: Wildland fire for resource objectives; American Indians; Ecocultural Restoration; Socioecological Resilience; Traditional Ecological Knowledge

Bio: Jonathan W. Long is a research ecologist with the Pacific Northwest Research Station and is based in Davis, California. He leads a variety of interdisciplinary research projects to help managers restore forests and wetlands to support important social and ecological values. For

over two decades he has been engaged in collaborative research with tribes. He worked previously for the Rocky Mountain Research Station, University of Arizona Cooperative Extension, and the White Mountain Apache Tribe in Arizona.

51. Fuel Treatments in Theory and Practice: Science Applications in Support of the Cohesive Strategy

Presenter: Kevin Barnett, Research Associate, The University of Montana

Co-Author(s):
Karin Riley, Research Ecologist, Rocky Mountain Research Station, US Forest Service
Helen Naughton, Associate Professor, Department of Economics, University of Montana
Matt Thompson, Research Forester, Rocky Mountain Research Station, US Forest Service

The Cohesive Strategy (CS) provides a comprehensive assessment of wildland fire across all lands of the United States, including general guidelines to assist land managers when planning wildland fire and hazardous fuels-related activities. One important theme is that an expanded use of wildland fire is necessary to achieve the goals put forth in the CS. In support of this recognition, the CS broadly identified areas where fuel treatments may be an economically viable precursor to the subsequent use of managed fire to achieve land management objectives. In theory, strategically placing treatments across a landscape can expand future low-risk opportunities for managed fire by reducing the risk or exposure of highly valued resources and assets to negative fire effects. In turn, multiple direct and indirect treatment benefits may be achieved through the reintroduction of fire. However, there remains an important knowledge gap between theory and practice that precludes an evaluation of fuel treatments at the programmatic level: whether and how the presence of fuel treatments influences decisions to manage wildland fire. Without such information, many of the assumptions over potential treatment benefits remain untested and can't be generalized. The purpose of this seminar is to explore the link between fuels management and fire management from both an applied and theoretical perspective.

Learning objectives:
We hope to engage land managers and members of the science community in a discussion over fuel treatment effectiveness in theory and practice. This discussion will begin with short presentations from selected scientists and managers working at the intersection of fuel treatments and wildland fire management. Following presentations, we envision a structured panel discussion with the presenters serving as expert panelists. Our goal is to facilitate an environment where managers and scientists can identify progress and barriers towards successful fuel treatment implementation.

Keywords: fuel treatments, incident management, fire risk, suppression costs

Bio: Kevin Barnett is a Research Associate in the Department of Economics at The University of Montana. Kevin is evaluating the effects of fuel treatments and previous fires on fire suppression expenditures.

52. Reconciling expansion of restorative burning with protecting public health from smoke impacts
Moderator: Craig Thomas, Conservation Director, Sierra Forest Legacy

Presenters: Jonathan Long, Ecologist, USDA Forest Service, Pacific Northwest Research Station
Malcolm North, Ecologist, USDA Forest Service, Pacific Southwest Research Station
Lee Tarnay, Physical Ecologist, USDA Forest Service, Region 5 Remote Sensing Lab
Randy Striplin, Fire planner, USDA Forest Service, Lake Tahoe Basin Management Unit
Becky Estes, Region 5 Central Sierra Province Ecologist
Julie Hunter, Senior Air Quality Specialist, Washoe County Health District

Smoke emissions from forests in the Western Pacific U.S., whether intentional or not, are likely to increase in coming decades due to a warming climate and accumulating fuels. If not strategically managed, increases in these emissions could degrade air quality and pose a health threat to human populations. In this session, presenters will discuss opportunities and constraints to use wildland fires to restore ecologically resilient forests while minimizing harmful smoke impacts. We will examine why managing wildfires for resource objectives, as well as prescribed burning, are so important to restoring landscape ecological resilience and public health, and how they can be arranged to constrain fire size, spread, and severity as well as associated smoke impacts. We will present data that compare emissions and smoke impacts from prescribed fires, resource objective wildfires, and full suppression wildfires. We will explain how various factors make emissions from fires managed for resource objectives far less likely to cause extensive harmful impacts to human populations, including reduced daily emissions, greater ability to regulate fire progression relative to dispersion, and greater ability to influence the timing of impacts and provide advance warning and mitigation for sensitive populations. However, systems for regulating smoke and managing fires will need to evolve further to support greater use of landscape-scale burns on the order of several hundred acres at a minimum. Speakers will explain how the combination of smoke monitoring, modeling, and smoke messaging approaches, often led by dedicated air resource advisors and fire management crews, can help to increase pace and scale of proactively managed fire.
The session feature short talks by researchers and managers followed by a roundtable discussion of challenges, opportunities, knowledge gaps, and policy solutions for increasing the pace and scale of using wildland fire.

- Importance of Managing Wildland Fire for Restoring Forest Landscapes
- Aligning Smoke Management with Forest Restoration and Public Health Goals
- Utilizing Burn Windows and Airshed Capacity
- Case Study from the Lake Tahoe Basin
- Case Study of the Caples Lake Burn, ElDorado NF
- Smoke Messaging
- Panel Discussion with Audience

Keywords: Air Quality, Smoke Impacts, Public Health, Prescribed Fire, Wildland Fire Managed For Resource Objectives

Bio: Jonathan W. Long is a research ecologist with the Pacific Southwest Research Station in Davis. He leads a variety of interdisciplinary research projects to help managers restore forests and wetlands to support important social and ecological values. He worked previously for the Rocky Mountain Research Station, University of Arizona Cooperative Extension, and the White Mountain Apache Tribe in Arizona.

53. Seeing Landscapes in a New Light Using the Online Landscape Dynamics Assessment Tools (LanDAT)

Presenter: Danny Lee, Center Director, Eastern Forest Environmental Threat Assessment Center (EFETAC), USDA Forest Service

Co-Author(s):
Lazarus Pomara, Ecologist, EFETAC, USDA Forest Service
Bjorn-Gustaf Brooks, EFETAC, USDA Forest Service
James Fox, Director, NEMAC, University of North Carolina Asheville

One of the primary objectives of the National Cohesive Strategy is to increase landscape resiliency. As frequently noted, resiliency is inherently contextual, meaning that it can be interpreted differently depending on local or regional conditions and aspirations. Such ambiguity (or flexibility) doesn't necessarily hinder local planning, but does make it difficult to compare systems across broad regions. More fundamentally, it is difficult to rigorously evaluate progress toward an objective that is difficult to define, let alone measure. The need for quantitative and repeatable measures of landscape resilienceor components thereofmotivated the development of the Landscape Dynamic Assessment Tool (LanDAT), an online analytical tool that utilizes an extensive library of remotely sensed information combined with advanced analytical techniques and ecological theory. Daily images captured by the MODIS remote imaging system provide a moderate resolution (13.2 ac pixels), continuous time series of vegetation change across the conterminous US dating back to 2000. These data have been processed in such a way as to provide a unique perspective on vegetation dynamics across scales, ranging from individual pixels to broad landscapes. By examining patterns of vegetation disturbance, growth, and recovery, one can infer aspects of the natural system's ability to resist or resile from disturbances such as wildfire. One can also compare different areas that vary in biogeographical settings or have experienced different disturbance or management regimes. This information has been synthesized and is being shared through an online, user-friendly system developed by the US Forest Service and its University partners. We propose to offer a brief seminar that will expose land managers and analysts to the functionality and application of this unique system. Participants are encouraged to identify specific geographical areas of interest that will be used as examples and explored collaboratively and in real-time during the seminar.

Keywords: Landscape resiliency, remote sensing, performance monitoring

Bio: Dr. Danny C. Lee is the Director of the USDA Forest Service's Eastern Forest Environmental Threat Assessment Center, established to develop knowledge and tools needed to predict, detect, and assess environmental threats to forests in the eastern United States. The Center is headquartered with the Southern Research Station in Asheville and has offices in Raleigh and Research Triangle Park, NC. Dr. Lee previously served as the co-leader of the National Science and Analysis Team assigned to the National Cohesive Wildland Fire Management Strategy effort led by the USDA Forest Service and US Department of Interior.

54. Understanding the Role of Drought Information in the Implementation of the Cohesive Strategy

Presenter: Timothy Brown, Research Professor, Desert Research Institute

Co-Author(s):
Tamara Wall, Associate Research Professor, Desert Research Institute

Drought has the potential to impact all three of the National Cohesive Wildland Fire Management Strategy (CS) key areas of restore and maintain landscapes, fire adapted communities and response to fire. For example, what is the role of hydroclimate change and variability combined with the legacy effects of past management practices on the efforts to restore and maintain landscapes? Drought conditions can alter where and how fire burns, and amplify safety concerns by increasing hazardous conditions for fire fighters and nearby communities during fire events. Extended and/or high frequency drought events increase management uncertainty and worsens treatment effectiveness in fuel management and restoration efforts, decreasing ecological resilience.
We propose a roundtable discussion to address several key questions in understanding of drought in relation to the implementation of the Cohesive Strategy. 1) What added challenges does drought bring to fire management planning and strategies? 2) What opportunities arise given drought during strategy implementation? 3) What are the best knowledge transfer methods and communication pathways for exchanging drought information and establishing networks? 4) What tools can be identified (existing or needed) that can inform and aid in CS implementation? These key questions will be given focus during the roundtable discussion comprised of wildland fire managers and researchers.

Keywords: Drought, wildland fire, Cohesive Strategy

Bio: Dr. Brown is a Research Professor at the Desert Research Institute (DRI) 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; and deliberate 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). He is graduate faculty in the University of Nevada, Reno Atmospheric Sciences Program, and a recent Adjunct in the School of Earth, Atmosphere and Environment, Science Faculty, Monash University, Melbourne, Australia.

55. Cooperative Prescribed Fire and Leveraging Local Resources using National Cohesive Strategy Principals

Presenter: Michael Caggiano, Research Associate, Colorado Forest Restoration Institute - Colorado State University

This presentation highlights an example of innovative multijurisdictional cooperative prescribed fire implementation, which was initiated four years ago in Ruidoso New Mexico, and funded by the US Forest Service's Collaborative Forest Restoration Program. The program, has successfully implemented multiple prescribed burns using cooperative efforts between the USFS and 8 community fire departments, and has provided the USFS with resources needed to implement burns it would not otherwise been able to accomplish by leveraging local firefighter participation and reimbursing fire departments for their participation. In doing so the project has also provided important fire-line experience to volunteer and municipal firefighters, allowing them to work on NWCG task books and qualifications, and helping improve interagency relationships. The program which has helped improve communication and coordination between local, state, and federal fire response agencies, is also helping to bridge the gap between fire service and natural resource professionals by integrating local firefighters into ecologically based restoration projects. Local firefighters are now in a better position to engage the public and direct conversations about the role of wildfire and mitigation activities, which combined with a robust public outreach program is improving public acceptance, fire culture, and the way the community lives with fire. Cooperatively conducting prescribed burns in this manner has helped build local capacity, has increased the scale of restoration activities, and has contributed to safer and more effective fire response which has led to positive outcomes during recent wildfires. To date the program has been a resounding success in the community. Supported by robust monitoring data indicating accomplishments and the degree of interagency coordination and capacity building, the program is now being expanded to other communities across New Mexico and Colorado. The presentation will described the context in which the program was developed, the institutional arrangements and mechanisms used to administer the initial model and subsequent efforts, showcase initial findings now being incorporated into best management practices, discuss next steps including how this model could be exported to and adapted for other communities interested in expanding the role of cooperative Rx fire.

Keywords: prescribed fire interagency collaboration wildland-urban interface

Bio: Mike Caggiano is a PhD candidate and Research Associate with the Colorado Forest Restoration Institute at Colorado State University. Prior to this role in academia he had worked as a community forester implementing hazardous fuel mitigation, conducting firewise outreach, updating community wildfire protection plans, and working in wildland fire. He now studies the physical pattern of development of the wildland-urban interface and wildfire related home loss using spatially based approaches, and also works with fire managers to improve fire response through developing and evaluating cooperative prescribed fire projects designed to increase local capacity.

56. Towards a Holistic and Consistent Approach to Prescribed Burning: the National Burning Project, Australia

Presenter: Murray Carter, Director, Office of Bushfire Risk Management Western Australia

The Australasian Fire and Emergency Service Authorities Council (AFAC), is the National Council for fire and emergency services in Australia. Through the National Burning Project, AFAC is undertaking a major national collaborative project to bring together inter-related aspects of prescribed burning to design guiding frameworks and principles for a more cohesive approach to prescribed burning.

Developing national frameworks and approaches has taken extensive consultation across agencies and jurisdictions and has fostered shared knowledge and networks amongst those that strategise and operationalise prescribed burning objectives. The project aims to aid in communicating these approaches to fire management practitioners and the wider public to gain acceptance of the science and practices that underpin prescribed burning programs.

The benefits of national frameworks and guidelines lie in developing consensus collaboratively, developing relationships, the improved strategies that come from accessing best practice, the ability to align varying approaches, a greater economy derived from using common standards and through achieving improved performance.

This presentation discusses the consultation that has brought together agency staff, not just from the public fire and emergency sectors, but also private enterprises, to produce best practice guidelines and frameworks including:

¢ The National Position on Prescribed Burning;
¢ National best practice guidelines for planning and implementing prescribed burns;
¢ National frameworks to address prescribed burning risks associated with ecological, fuel management, smoke, greenhouse and operational safety issues;
¢ Training manuals to support a range of prescribed burning competencies;
¢ Objectives and monitoring frameworks;
¢ Case studies; and
¢ Reviews of science, best practice and capability.

Keywords: Prescribed burning, national frameworks, burning guidelines

Bio: Mr Carter has held the position of Director OBRM for the past two and a half years. OBRM is an independent Office responsible to the Fire and Emergency Services Commissioner, WA. The role of OBRM is to enhance the efficient and effective management of bushfire related risk in WA in order to protect people, assets and other things valuable to community. It's functions include, among others, the regulation of prescribed burning and the application of a risk management framework to the use of planned fire.

Prior to the OBRM appointment, Mr Carter was the Manager, Fire Management Services Branch (Chief Fire Officer) for the Department of Parks and Wildlife WA. During his time in this role he led the reform of the Departments prescribed fire program into alignment with the International Standard for Risk Management, AS/NZS ISO 31000; 2009 Risk Management Principles and Guidelines. Mr Carter is a graduate of the Australian Institute of Company

Directors, Director training and has thirty years of operational bushfire and emergency management experience with a strong focus on prescribed burning.
Mr Carter is currently the Chairperson of the Australasian Fire and Emergency Service Authorities Rural and Land Management Group and the Western Australian State Bushfire Coordinating Committee.

57. Prescribed Fire Training Exchange (TREX) - Burning Together, Learning Together
Presenter: Erin Banwell

Co-Author(s):
Jeremy Bailey, Fire Training and Network Coordinator, The Nature Conservancy

In 2008, The Nature Conservancy Fire Learning Network designed a collaborative Prescribed Fire Training Exchange (TREX) program that provides hands-on training experiences, promotes cooperative coordination of resources and burn windows, and engages the public through positive media outreach. These training events focus on integrating prescribed fire into ecological, cultural, and social context.
Since 2008, over 50 TREX events have been held across the United States. During these training events, participants from assorted backgrounds implement prescribed fires on a diversity of land ownerships and ecosystems, and these events truly represent the focus of the Cohesive Wildland Fire Strategy, all hands, all lands.
The use of prescribed fire as a tool for restoring fire-excluded ecosystems and reducing the risk of large and severe wildfires is well-known (Brown et al. 2004, Reinhardt et al. 2008). However, the lack of adequately trained personnel with prescribed fire qualifications, ecological understanding, and multijurisdictional capabilities is a barrier to implementing prescribed fires (Konziar et al. 2009, Quinn-Davidson and Varner 2012). Hands-on prescribed fire experience, quality training assignments, and education in fire science and ecology are necessary to train both federal and nonfederal fire professionals (Kobziar et al. 2009, Spencer et al. 2015). A study by Spencer and others (2015) showed that TREX events meet the development needs for a diverse group of students and professionals. TREX events increase networking and build partnerships, which allows for more burning across multijurisdictional boundaries (Spencer et al. 2015, Stephens et al. 2016).
These TREX events are great examples of how the Cohesive Wildland Fire Strategy is being used to meet all three national goals; (1) creating fire-resilient landscapes, (2) promoting fire-adapted communities, and (3) supporting safe and effective wildfire response.
This presentation will discuss the tools and resources available for collaborative planning and implementation of prescribed fire across the country using the TREX model. Success stories of how TREX events have been used to work through barriers to burning will also be presented.

Keywords: collaboration, TREX, training, prescribed fire, multijurisdictional, outreach, TNC, FLN

Bio: Erin has trained Fire Effects Monitors at Prescribed Fire Training Exchange (TREX) events since 2013. She is passionate about establishing specific, measurable, attainable, realistic, and

timely prescribed fire objectives, along with building monitoring programs to ensure objectives are being met. Erin has worked for the Bureau of Land Management as a Planning and Environmental Specialist, Sonoma Technology Inc. as a Wildland Fire Ecologist, and Redwood National Park as a Fire Effects Monitor. She was a Research Assistant in the Wildland Fire Laboratory at Humboldt State University, where she obtained a Masters degree on forest floor characteristics in long-unburned Jeffrey pine-white fir forests of the Lake Tahoe Basin.

58. Like Fine Whiskey, Fire-effects Monitoring Improves Over Time
Presenter: Alison Dean, Fire Effects Monitoring Coordinator, Central Oregon Fire Management Service

Many worthwhile things take years to reach full potential, and prescribed fire is one of them. Long-term monitoring has yielded insight into processes of ecological change and resilience. We have learned that observations and apparent trends from 1-year monitoring are often not predictive of the 5-year or longer-term site condition. This talk will describe two projects that began with conflict, were considered failures in the short term, and in the long term were reevaluated as successful achievements. Success came from expanding the interval of measurement and reviewing the lessons with a wide audience. One project in a Ponderosa-bitterbrush system compared fire and fire surrogates for mule deer habitat improvement. In another project, a range-restoration burn was complicated by the presence of sensitive species. Both case studies provide examples of an interdisciplinary process of establishing objectives, monitoring change over time, evaluating results, and adapting management decisions.

Keywords: Long-term fire effects monitoring

Bio: Alison started out as a soil scientist and watershed manager involved in monitoring erosion following the Cerro Grande Fire in Los Alamos. Fascinated by fire, she spent several years on engine crews and Prineville Hotshots before her current interagency position studying the effects of fire and fuel treatments on FS and BLM land in Central Oregon. She holds a B.S. in Soil and Water Science and M.S. in Watershed Management/Hydrology, both from the University of Arizona, and has earned a fire ecologist certification through the Association for Fire Ecology.

59 Contracted Resources for Fire Suppression in the Northwestern United States: Engine Dispatch Patterns and Contractor Profiles
Presenter: Heidi Huber, Research Associate, Ecosystem Workforce Program, Institute for a Sustainable Environment, University of Oregon

Co-Author(s):
Cassandra Moseley, Associate Vice President for Research- University of Oregon, and Director - Institute for a Sustainable Environment, University of Oregon
Katie Lyon, Social Scientist, Human Dimensions Branch, National Wildlife Refuge System, US Fish and Wildlife Service

Christopher Bone, Assistant Professor, Department of Geography, University of Oregon
Nathan Mosurinjohn, Institute for a Sustainable Environment, University of Oregon

As demand for wildfire response resources grows across the globe, a central challenge is developing new and flexible systems and capacity to ensure that resources needed for fire response arrive when and where they are needed. Private contractors have become increasingly important in providing equipment and services to support agency wildfire suppression needs in the USA. Understanding the capacity of contracted resources and how these businesses operate and provide resources for federal agency fire suppression needs is critical for preseason fire planning and response. This understanding of fire contractors also informs the development and maintenance of local, trained workforces for fire response. This presentation provides some highlights from a recently completed Joint Fire Science Program research project investigating private contracting for fire suppression in the west. Using both National Resource Ordering and Status System data, and interviews with 131 fire businesses in Oregon and Washington, we will show recent contracted engine dispatch, and describe contractor business profiles.

Keywords: Fire contracting, local workforce, dispatch, wildfire engines

Bio: Heidi Huber-Stearns is a faculty Research Assistant at the Institute for a Sustainable Environment at the University of Oregon. She works on a variety of social and economic aspects of forest and water policy, including wildfire suppression contracting, social and economic monitoring, forest governance, and investments in watershed services. She has a PhD from Colorado State University.

60. Research in Complex Adaptive Systems as applied to All Hands, All Lands'?
Presenter: Stephen Guerin, SimTable

61. Community Wildfire Protection Plans in Colorado: A Statewide Survey
Presenter: James Absher, Affiliate, Colorado State University

Co-Author(s):
Jerry Vaske, Ph.D., Professor, Colorado State University
Courtney Peterson, Wildfire Mitigation Education Coordinator, Colorado State Forest Service

Colorado now has 235 Community Wildfire Protection Plans (CWPPs) written at different levels (county-wide, fire protection district, owners association, and a diverse others group). In 2015, there were 212 completed CWPPs and a short statewide survey of them was done. The survey was completed by 127 key informants representing CWPPs at all levels (60%response rate), and then case weighted to reflect the overall mix of CWPPs by level across Colorado. This presentation looks at five aspects of CWPP implementation: fuels reduction, acres treated, funding assistance, perceived obstacles and outreach actions. First a full sample overview of

the results generalizable to Colorado will be presented. Fuels related actions are much more prevalent than community focused ones. Next, the presentation will move on to statistical comparisons among the three organizationally comparable levels of CWPPs (county, fire protection district and owner association). There are observable differences for fuels reduction, acres treated, and funding assistance. The three CWPP levels did not differ in terms of perceived obstacles except for time available. There are statistically valid differences in outreach actions, email use and community meetings. The three levels of CWPP did not differ relative to the use of postal mailings and webpage outreach. We summarize the implications for practice and offer suggestions for the development, implementation and success of CWPPs, especially where multiple levels exist in an area (e.g., both a county-wide and owners association CWPP may exist).

Keywords: CWPP, implementation, Colorado, levels, fuels, outreach, communication

Bio: Dr. James Absher is a natural resources sociologist with nearly 50 years of experience in research and academia. Recently retired from the USDA Forest Service R&D branch, he continues to work as a consultant, emeritus Forest Service scientist, and affiliate at Colorado State University. His research is focused on a range of human dimension issues associated with land management, including wildland fire (homeowner risk mitigation, agency support) and processes that affect planning and governance issues. He applies relevant social science theories and findings to achieve a better understanding of, or some demonstrable improvements to, management, program delivery, and administrative processes.

62. Developing Adapation "Pathways" for the Co-management of Wildfire: An Interactional Approach

Presenter: Travis Paveglio, Assistant Professor, University of Idaho

Co-Author(s):
Dan Williams, research social scientist, USFS
Matthew Carroll, professor, Washington State University

Results from existing wildfire science demonstrate that there is no one overarching approach to the co-management of wildfire risk. Rather, diverse human populations will support or enact different programs, policies and planning approaches to better live with wildfire in places characterized by a complex mosaic of private and public lands. Few conceptual approaches systematically link local social context with flexible wildfire management strategies most likely to succeed among diverse populations and landscapes where people are a primary influence. This presentation builds on the authors' existing conceptual approach for characterizing local socio-ecological conditions that influence how and why populations might adapt differently to changing wildfire conditions. We use examples from 20 years of case studies on wildfire planning, response and recovery to discuss the applicability of commonly cited programs (e.g. Firewise, Community Wildfire Protection Plans), mitigation approaches (e.g. fuel breaks, home ignition zone treatments) and policies (e.g. evacuation, suppression priorities, building codes) across a range of U.S. communities. Our primary goal is to hypothesize a range of fire

adaptation pathwayslinked sets of incentives, actions, and policies that best fit the ongoing evolution of people and wildfire in a dynamic local system. We explain how our conceptual approach can be used to better understand variance in support or effectiveness for each of the components comprising pathways, and how their individual elements combine to best reflect strategies that land managers and private citizens can use to co-manage wildfire at different scales given their local circumstances. Our presentation also outlines a methodological approach for systematically collecting longitudinal data that can serve as the scientific basis for creating or monitoring progress toward the goal of creating fire adapted communities. The presentation concludes by discussing the value of understanding adaptation to wildfire as an ongoing process, and the ways that science can better reflect that distinction. This includes a focus on linked, evolving methodological approaches that can produce practical science focused on the dynamic relationship between landscapes and people experiencing fire events.

Keywords: Wildland urban interface; Fire adapted communities; community archetypes

Bio: Travis Paveglio is an assistant professor of natural resource sociology in the Department of Natural Resources and Society at the University of Idaho. His research focuses on the human and policy dimensions of wildfire management (e.g. evacuation policies, fuel reduction planning, homeowner mitigation actions, suppression activities, identification of values-at-risk, and recovery aid), with an overarching emphasis on the ways that diverse populations adapt to changing landscapes. Paveglio conducts both qualitative and quantitative case studies of collaborative wildfire risk management, response and recovery in communities across the United States.