ABSTRACTS AND PRESENTER BIOGRAPHICAL INFORMATION

Abstracts for presentations and biographical information are listed alphabetically below by presenting author's name. Abstracts and biographical information appear unmodified, as submitted by the corresponding authors.

Abrahamson, Ilana

Ilana Abrahamson, Ecologist, Affiliated with the University of Montana, National Center for Landscape Fire Analysis; and Rocky Mountain Research Station, Fire Sciences Laboratory. Ilana Abrahamson is an ecologist and writer for the Fire Effects Information System (FEIS) at the Missoula Fire Sciences Laboratory. Ilana received her MS in forestry from the University of Montana. Prior to joining the Fire Sciences Laboratory, Ilana worked in several National Parks on a variety of vegetation and fire management projects.

Syntheses of Historical Fire Regimes and Contemporary Changes

Poster Presentation

Managers and planners need scientifically sound, up-to-date information on historical fire regimes and contemporary changes in fuels and fire regimes in particular ecosystems. To address the need for clear, concise information about historical fire regimes and changing conditions, we developed a new product, the Fire Regime Synthesis, in the Fire Effects Information System (FEIS, http://www.feis-crs.org/feis/). Fire Regime Syntheses present current information on historical fire frequency, spatial pattern, extent, and seasonality; historical ignition sources; and typical patterns of fire intensity and severity. They also provide information on contemporary changes in fuels, especially in relation to their potential to influence fire regimes. Fire Regime Syntheses bring together information from 2 sources: the scientific literature and the Biophysical Settings (BpS) models and associated geospatial data developed by LANDFIRE (http://www.landfire.gov/fireregime.php). Fire Regime Syntheses provide region- and ecosystem-specific information, which enables managers to make informed decisions about local management of fire and fuels.

Acosta Lugo, Efraim

Technical coordinator of Pronatura since 2007. Biologist (Yucatan Authonomous University). Conservation planning and environmental policy expert. Has coordinated local and regional planning processes, land zoning and conservation area plans. Involved in fire management since 2008, as part of Pronatura has leaded the tri-state coordination efforts through the Regional Program for Wildfire Attention in the Yucatan Peninsula, México

The Regional Program for Wildfire Attention in the Yucatan Peninsula, México

Oral Presentation

Historically, 45% of forest fires affecting adult trees in Mexico occur in the Yucatan Peninsula. The rapid change in land use in the region, for farming, real estate development make for a high incidence of hurricanes, are the main events that have generated an imminent risk of wildfires, threatening not only the biodiversity of federal, state and private ecological reserves in its area of influence but also very important human settlements and their productive activities. An analysis with regional stakeholders in 2009 found that the impacts of these fires are increased by poor communication and coordination between the agencies working in this field, rural producers and civil society. The lack of a regional policy involving local, state and federal stakeholders was determined to be a major factor in wildfire prevalence. As a response a Promoter Group formed by state managers of CONAFOR, CONANP, the head of the three State Wildfire Committees and PPY established the Regional Program for Wildfire Attention (PAR). The Group is responsible for collecting and organizing the ecological and socio-economic information, to identify information gaps, and to facilitate and help design the necessary strategies with key stakeholders. With the support of FMCN, WWF-FCS the Group has been able to • Provide a description of the region and its attributes. • Locate priority areas for forest fire risk. • Identify the resources available and their location (personnel, crews, equipment). • Carry out coordinated prevention and suppression measures. • Agree on a joint protocol for action in case of forest fires in state border areas following the current regulations. • Stablish strategies, agreements and mechanisms for coordination and communication among regional stakeholders.

Effectively train state incident management teams (EEMI) and local specialized brigades One of the key points of the process has been the regional approach and multiscale: actions ranging from local to regional defined and cut across all regional stakeholders in thematic areas such as management, training, equipment, information management and environmental education. This has allowed all stakeholders meet and adopt a leading role in the process according to their abilities and capacities.

Adkins, Jaron

Jaron Adkins is a PhD student in the forestry department at Michigan State University. He earned his Bachelor of Science in Biology from Boise State University, where he researched the role of root structure in the promotion of soil carbon sequestration in managed grasslands.

The role of fire severity of post-fire ecosystem carbon dynamics

Student Poster Presentation

Global climate change and decades of fire suppression have altered the timing, frequency, and severity of fires in the mixed-conifer forests of the Western United States. Forests and forest soils hold large carbon (C) stocks and account for the largest proportion of terrestrial C sinks. However, wildfires transform forest stands from C sinks to C sources, causing C emissions directly through combustion and indirectly through altered decomposition dynamics. The magnitude of changes may be affected by wildfire severity, but there has been little research assessing the role of fire severity on forest soil C stocks and fluxes. In summer 2014, we assessed forest floor and soil C stocks across a burn severity gradient from sites affected by the Chips wildfire complex, a 2012 wildfire that burned nearly 30,000 acres of Northern California mixed-conifer forest. Preliminary results indicate that the wildfire resulted in a reduction of total soil C stocks compared to unburned controls, primarily through a reduction in forest floor mass, but we did not detect an impact of burn severity on total soil C stocks. We will present data assessing the impacts of burn severity on ex situ soil CO2 flux from soils to be collected from Chips burn sites in summer 2015. Results from our study will increase understanding of fire severity impacts on post-fire ecosystem C dynamics.

Agne, Michelle

Michelle Agne is a faculty research assistant in the College of Forestry at Oregon State University. She completed her MS at Oregon State in 2013 and published her thesis work "Effects of dwarf mistletoe on stand structure of lodgepole pine forests 21-28 years post-mountain pine beetle epidemic in central Oregon" in PLoS ONE in 2014.

Post-mountain pine beetle lodgepole pine forests: assessing fire effects in the recently burned Pole Creek Fire area, East Cascades Mountains of Oregon, USA

Oral Presentation

Large scale mountain pine beetle (MPB) outbreaks have created concern regarding subsequent fire and the need to understand synergistic effects of multiple disturbances on the landscape. However, most research on this topic has been derived from fire behavior models rather than direct observation or post-fire monitoring. The Pole Creek Fire provides a unique opportunity for comparison with previous findings due to MPB mortality 8-15 years prior to fire in the lodgepole pine type within the fire perimeter. One year post-fire, we established 52 plots, stratified by fire and MPB severity, for the measurement of post-fire structure and fire effects to answer the questions: 1) How did stand structure change following these disturbances? 2) What was the effect of previous MPB severity on fire severity in multiple strata (e.g., ground, surface, and canopy)? We found that: 1) Live density, basal area, and quadratic mean diameter decreased significantly over both disturbances, and lodgepole pine remained the dominant tree species. 2) Fire severity in all strata decreased with increasing MPB severity. In general, these results support previous findings, except that the dominant tree species did not change and crown fire was more common than previously predicted for this period of time since beetle.

Allison, Kristen

Kristen Allison, District Fuels Specialist Eugene District Office Enjoys finding novel ways to take out of the box emerging technologies to improve efficiencies and situational awareness on the fire line, and in the office.

PhoDar, using cameras to cut costs and gain insight

Poster Presentation

After LiDar using phoDar (photogrammetric point cloud) can expand existing knowledge with much less costs, PhoDar or the use of camera to build on LiDar information gives a better depth of intel since it can be done at many angles it allows for better true color and richer imagery which when pulled into applications such as Arc GIS you can run better analysis, and the ability to train the imagery and help with prioritization and planning.

Alvarado, Ernesto

Ernesto Alvarado is a wildland fire sciences professor at the University of Washington whose research covers a variety of wildfire topics, from fire modeling, fire management, tropical forestry, fires and climate change, the WUI, to traditional ecological knowledge. He works on tribal reservations, federal and state lands of the Americas, from the boreal forests of Alaska, western United States, protected areas in Mexico, and the tropical forests of Brazil, Bolivia, and Mexico. He has been a visiting scientist at universities and research institutions in Brazil, Mexico, Bolivia, and Portugal.

Threat of Large Wildfires on the Boundaries Between Indian Reservations and Federal Lands in the State of Washington

Oral Presentation

Forest landscapes reflect the dynamics of physical and biological settings, but also differences in land use implemented by different ownerships. Forest spatial patterns, processes, health and fire hazard exceed legal ownership boundaries. Federal lands are increasingly threatened by large wildfires due to decades of fire suppression and climate change. Many landscapes on Indian reservations, on the other hand, show lower fire hazard than similar federal lands. The Yakama and Colville Nations in Washington continue the tradition of active management and fire use initiated the first half of the 20th Century by Harold Weaver. This is expressed on differences on landscape patterns, stand structure, diversity, and richness between the Yakama Forest and neighboring national forests, which has implication on resilience to severe fires. Tribal managers are concerned about losses from large wildfires moving across boundaries that are devastating to tribes. To address those issues, tribes and federal agencies have entered into agreements to achieve more significant outcomes than by working individually. However, differences among federal and tribal lands need recognition. A solution proposed by tribal managers is to increase cross-boundary management and implementing silvicultural and fuel treatments following the tribal model that will improve forest health and resilience to large wildfires.

Fire Effects on Bolivian Production Forests

Oral Presentation

Conservation of Bolivian forests is based on the sustainable management of these ecosystems that tries to achieve social, economic, and ecological balance. Over the last couple of decades, Bolivia has experienced an increase in severe fire seasons that threaten the sustainability of its forest productivity and the livelihood communities. Every 4-5 years, Bolivia experiences devastating wildfires that affect production forests, agriculture, and communities. Over the last ten years, fires burned approximately 33 million hectares. The last major wildfire season was in 2010 when 5 million hectares burned. Nevertheless, little information is available on ecological effects of wildfires. Most wildfires are caused from escaped agricultural burning into tropical forest, which is becoming more vulnerable to fires due to selective logging, increasing industrial agriculture, and climate change. We evaluated the effects of surface fires on three types of production forests for generating information for fire management. Tree mortality, regeneration, and tree growth after fire was evaluated one and two years after fires for three types of forests: Amazonian, transitional Amazonian-Chiquitano, and Chiquitano forests. Results indicate that the Chiquitano dry forest is the most vulnerable to fire, followed by the Amazonian-Chiquitano transitional forest, and by the Amazon forest.

Amato, Sam

Sam Amato began his career with Rocky Mountain National Park as a seasonal firefighter. After Completing a Masters Degree in Fire Ecology at Colorado State University, Sam worked as a Fire Application Specialist for the

Forest Service Southwest Regional Office. In 2009, Sam began working for WFM RD&A as a Fire Application Specialist. Currently Sam works in several focus areas of the WFM RD&A, including Fuels, Technology Transfer, and Decision Support. Sam is qualified as an ENGB, FIRB, FEMO and LTAN. During fire season the majority of Sam's time is spent in remote and onsite wildland fire support.

Simplistic Tools used to Support Incident-level Decision-making: The Three Day Fire, Alaska

Poster Presentation

Over ten thousand lightning strikes resulting in over one hundred new fire starts accompanied the 2015 summer solstice in Alaska this year and further exhausted fire-fighting resources in the region. Scarcity of resources resulted in some fires being managed as unstaffed. In one particular case, the three day fire spanning both the Koyukuk National Wildlife Refuge and BLM Galena Zone, was placed in patrol status and monitored. This poster explores some of the tools and information used to support decision making on this wildfire following a risk-based approach specific to incident level fire management (Taber et al. 2013). The Fire Spread Probability (FSPro) fire behavior modeling system was applied to gain situational awareness and identify the probability of impacting values at risk. After a decision was made to place the fire in monitor status, a variety of simplistic remote sensing products, in addition to bi-weekly flights, were used to evaluate fire progress and support the evaluation phase of the decision making cycle. Specifically, examples of applying Modis and Viirs to monitor fire progression and the Burned Area Reflectance Classification (BARC) data to monitor post-fire vegetation condition are discussed and relevant for communicating benefit and consequence to natural resources from wildfire.

Amoako, Esther

Esther Ekua Amoako is a lecturer, University for Development Studies, Ghana, Department of Ecotourism and Environmental Management, Faculty of Renewable Natural Resources. She teaches Biodiversity and Conservation, Climate Change Mitigation and Introduction to Environmental Science. Until her appointment as a lecturer, she had been working in rural communities in the Northern and Upper East regions of Ghana. She is currently a CIRCLE Fellow, University of Dar es salaam, PhD student, Rhodes University, South Africa. She has established Environmental Literacy Clubs in three basic schools in Nyankpala, where she uses methods such as visioning and picturing to create awareness on the environment.

Assessment of the effect of burning regimes on plants and soils in West African savanna/parklands. A case of the Northern region of Ghana

Poster Presentation

Time, frequency and intensity of fire have influence on plant species, soil organic compounds and on the viability of soil seedbank. Bush burning, controlled or indiscriminate continue to be among the most important dynamic factors influencing diversity and density of plant communities. Thus, the study was conducted to assess the effect of burning on tree species, soil nutrients and soil seed bank. Soil samples were collected from three experimental treatments (late season burning, early season burning and non-burning) at the Mole National park. Samples were analysed for basic soil nutrients. Germination experiments were set up to monitor seedling emergence from soil seed bank. Tree species were also identified and enumerated in each treatment. Seedlings that emerged during the period of 8 weeks, were identified as monocots and dicots. Species diversity and density were determined and the means between treatments compared. The study revealed that burning has significant influence on density of soil seed bank ($P = 0.0405$) and soil nutrients ($P = 0.0001$). The extent of influence, however depends on the time of burning. Simpson's diversity index showed higher diversity of plant species on burnt plots than non burnt plots.

Anderson, McRee

McRee Anderson is The Nature Conservancy's Director of Fire Restoration Program in Arkansas and the former Planning Director for the recently formed Shortleaf Pine Initiative. In addition, he is also the South-Central Leader for the Fire Learning Network, with 15 landscape-scale project sites totaling one-half million acres. As Arkansas' Program Director, he co-manages Arkansas Fire Program, conducting over 50 prescribed burns over 10,000 acres annually. McRee is Co-Chair of the Oak Ecosystem Restoration Team, which brings together regional partners to address forest health issues related to altered fire regimes. McRee is a founding member of the Arkansas Prescribed Fire Council and currently serves as Chairman of the council. McRee is involved with international fire and forest management issues in Mexico, Honduras and Zambia, Africa. McRee received a Masters degree in Natural Resources from Portland State University and is certified as a RXB2 burn boss.

The Shortleaf Pine Initiative: Developing an Institutionalized Framework to Restore an Imperiled Ecosystem

Oral Presentation

Shortleaf pine forest and woodlands once covered a vast area of the continent stretching from eastern Texas to the eastern seaboard from New Jersey to Florida. Early settlers and Government Land Office surveys describe these pine dominated and mixed pine-oak forests as open woodlands where sunlight reached the ground and native wildlife flourished. Over the last 30 years, the shortleaf pine ecosystem has lost over 50% of its former acreage with most of the significant decline taking place east of the Mississippi River. Massive pine beetle outbreaks in poorly managed stands, changes in timber management practices, altered fire regimes, disease, and land use changes have contributed to this rapid decline. In 2013, to address the multiple threats facing this imperiled ecosystem, the Shortleaf Pine Initiative (SPI) was formed. The SPI represents a broad range of public and private organizations, as well as key state and federal agencies currently working in the shortleaf pine ecosystem. Information gathered from expert workshops across the range of Shortleaf Pine has led to the development of the Range-wide Shortleaf Pine Conservation Plan with seven core strategies identified and currently being implemented.

Bahr, Richard

Dick works in the Department of the Interior, Office of Wildland Fire where he is the Deputy Director, Management and Programs. He coordinates the fuels, preparedness, response, emergency operations and wildland fire information technologies programs providing guidance, policy and oversight of the Interior Bureaus implementation of wildland fire. Prior to this he had a 37-year career with the National Park Service. He has enjoy working in such areas as Glacier, Everglades and Yellowstone National Parks. He co-chaired the writing of the "Guidance for Implementation of Federal Wildland Fire Management Policy - 2009"

Federal Wildland Fire Policy: Help or Hindrance to Managing Fire on the Landscape

Oral Presentation

Over the past century Federal Wildland Fire Management policy has evolved based on the influence and balance of the ecological, social-political and financial environments. The vignettes of wildland fire on the landscape across that century show the forces that result in changes to policy that is not always incremental when major disturbance happen. By understanding this history of policy change is to recognize change is inevitable and to prepare for the future it will be important learn to manage the cycle of change and focus more on the desire to accept future change and less on the desired condition. Look to wildland fire management policy to broaden how to think about high reliability, signal detection and resiliency and how that shows up across the landscapes we manage. From the voice of the land and drawing upon insights made by an anthropologist of society sustainability you shall question your view fire management policy and what in mean to implement fire in the future. Remember we (people) wrote the policy, we're not perfect and it can be revised but you do so apply patience.

Policy - Who speaks for the land - What got us here

Oral Presentation

Over the past century Federal Wildland Fire Management policy has evolved based on the influence and balance of the ecological, social-political and financial environments. The vignettes of that century show the forces that result in changes to policy that is not always incremental when major disturbance happen. With this understanding of history to recognize change is inevitable and to prepare for the future it will be important learn to manage the cycle of change and focus more on the desire to accept future change. Look at the history of wildland fire manage policy to broaden how to think about high reliability, signal detection and resiliency and fire management and drawing upon insight made by an anthropologist of society sustainability to offer voice to how you view fire management policy and implement it in the future. Remember people wrote the policy and it can be revised.

Bailey, Andrew

Andrew is Data Manager for the Wildland Fire Management RD&A in Boise, ID. His interest is in coordinating and responding to the data and analysis needs of the interagency wildland fire community, including oversight of the datasets used in the Wildland Fire Decision Support System (WFDSS). Andrew has previously served with the North Carolina Forest Service, Alion Science and Technology Corporation, the Southeast Gap Analysis Project, and the USDA Forest Service Southern Research Station. He has a Master of Science degree in Forestry and a Bachelor's of Science degree in Forest Management with a minor in computer science from NC State University.

Informed decision making for wildfire response utilizing WFDSS Spatial Fire Planning to represent Land and Resource Management Plan direction

Oral Presentation

Each federal land management unit has a Land and Resource Management Plan in which Strategic Objectives and Management Requirements related to the landscape and its resources are described to guide decision-making for the unit, including the response to wildfire incidents. The Wildland Fire Decision Support System (WFDSS) provides a method to spatially display a unit's Land and Resource Management Plan direction to facilitate quicker comprehension of unit objectives and requirements as they relate to wildfire at the time of an incident to facilitate timely and informed decision making. Utilizing the Spatial Fire Planning method in WFDSS, units can quickly see their plan objectives and constraints as it pertains to wildfires. This allows decision-makers to provide clear direction (via incident objectives and incident requirements) to Incident Management Teams or local fire managers regarding when, where, and under what circumstances desired courses of action should be taken in response to a wildfire.

Ball, Lucien

Lucien (Luke) Ball began his career in wildland fire management in 1998 with the U.S. Fish and Wildlife Service at the Balcones Canyonlands National Wildlife Refuge. During his time in Federal firefighting service he participated in wildfire suppression, prescribed fire, and all-risk incidents. In September 2011, Luke began working as the Fire Management Coordinator at the City of Austin Wildland Conservation Division in order to contribute to the mission of wildland protection in his home town.

Unanticipated seasonal predictability of live fuel moisture in central Texas

Oral Presentation

Live fuel moisture in the evergreen conifer Ashe juniper (Juniperus ashei) has been identified as an important factor in fire behavior in the central Texas region. An awareness of this live fuel moisture content has management applications that include aiding wildfire preparedness and prescribed fire planning. Austin Water Utility Wildland Conservation Division volunteers have been measuring Ashe juniper live fuel moistures at four sites in Travis and Hays Counties, Texas since 2007, generating an almost unbroken 8-year dataset. The data display an obvious difference in variability between winter (dormant season) and summer (growing season). Summer live fuel moistures tend to vary widely while winter live fuel moistures have consistently contracted into a fairly narrow range. Such seasonal variability counters a common expectation that Ashe juniper live fuel moisture responds primarily to soil moisture availability. More analyses reveal an interaction between season (solar radiation) and soil moisture availability (Keetch-Byram Drought Index) that may be driving changes in Ashe juniper live fuel moisture. This interaction may reflect seasonal shifts between ecosystem-level energy-limited versus water-limited resource availability. This improved understanding of the relationship between environmental factors and resulting live fuel moisture response will allow for better planning of fire management operations.

Bastian, Henry

Henry Bastian, is a DOI Office of Wildland Fire Natural Resource Manager / Fire Ecologist. Laurie Kurth and Frankie Romero are USDA Forest Service, Fire and Aviation Management, Fuels and Fire Ecology, Applied Fire Ecologists. All three have contributed to and continue to support wildland fire management across the landscape.

Historical overview of Fire in Resource Management - Federal Lands

Oral Presentation

The Forest Service and Department of Interior have been managing fire for over a century and the concept of fire management continues to evolve. During the last part of this century, fire has been used by federal agencies to manage ecosystems and reduce fuels. This presentation will review the trends in management decisions on fires and the opportunities and realities of fire management in the context of changing human landscapes, climate, and political direction. Wildland fire pervades all lands with ever increasing complexities and demands in managing political, social and ecological needs for the nation's natural resources. What has been accomplished? Is the wildland fire program headed in the right direction? What are unrealistic expectations? This presentation will focus on wildland fire management strategies and decisions in managing on Federal lands in the United States.

Battaglia, Mike

Mike Battaglia is a Research Forester at the United States Forest Service Rocky Mountain Research Station in Fort Collins, CO. His research focuses on forest stand dynamics, restoration of dry conifer forests, and fire hazard mitigation strategies.

Tree refugia within megafire perimeters indicate very long recovery times for dry conifer forests of the interior West

Oral Presentation

Considering that wildfire size and severity is likely to increase into the future with drier climate, it is important that we understand wildfire effects and ecosystem recovery. We explore patterns in tree refugia within wildfire perimeters throughout the Rocky Mountains and Black Hills in dry mixed conifer forests using aerial imagery to better recognize where tree refugia exist and to make inferences on recovery times. Our results suggest that high severity fire accounted for >20% of burned area. Wildfire size, percentage of area burned by high severity stand replacing fire, and the relative frequency of smaller tree islands were positively correlated. These results have serious implications for ecosystem recovery. Regeneration distances required to initiate forest recovery far exceed 1.5 canopy height or 200 m, distances where the vast majority of regeneration is likely to arise. Our results indicate that large patches of stand replacing fires are likely to lead to uneven aged forest, very long recovery times, and great uncertainty in the structure of forest in Western dry conifer forests.

Tree regeneration and growth response to mastication: Does mastication depth matter?

Oral Presentation

Mastication, the on-site disposal of small-diameter trees through chipping and shredding, is a common hazardous fuels treatment. Mastication increases the load and continuity of surface fuels, and creates a deeper forest floor layer that may act as a physical barrier to plant germination or as a nutrient sink that slows plant growth. Five to seven years post-treatment, we inventoried seedlings and measured the surrounding mastication depth in 1 x 1 m plots along transects in 17 masticated sites across three coniferous forest types. Douglas-fir (PSME), pinyon pine (PIED), ponderosa pine (PIPO), and lodgepole pine (PICO) seedlings established in mastication depths up to 7 cm. At each site, we also established 2 x 2 m experimental plots with three distinct depths (0, 7 and 15 cm). In these plots we planted PIPO, PSME, and PICO seedlings and harvested them three years later. For all three tree species, biomass, diameter and height growth were not negatively impacted and in sometimes increased as mastication depth increased. Results from this study will help clarify the mechanisms that favor and discourage tree seedling germination and establishment in masticated areas and will provide management recommendations that emphasize how best to distribute masticated material across treated sites.

Beck, Jeffrey

Dr. Jeff Beck is an Associate Professor of wildlife habitat restoration ecology at the University of Wyoming. Dr. Beck's work has been conducted in forest and rangeland systems in the Great Basin, Colorado Plateau, Rocky Mountains, and Sagebrush Steppe. The work he and his students conduct primarily focuses on 1) understanding better the direct and indirect impacts of anthropogenic disturbance on vertebrate species (greater sage-grouse and ungulates as model taxa), and 2) evaluation of the efficacy of mitigation techniques and conservation practices intended to enhance habitat conditions or mitigate effects of anthropogenic development in disturbed rangelands, particularly in sagebrush systems.

Sage-Grouse and Sagebrush Habitat Response to Fire

Oral Presentation

Due to their obligate relationship with big sagebrush (Artemisia tridentata), conservation of habitats used by sage-grouse (Centrocercus spp.) populations serves a surrogate role in conserving habitat for other vertebrate species that depend on sagebrush habitats. Big sagebrush forms most of the habitat used by these iconic wildlife species; however, the range-wide distribution of big sagebrush and sage-grouse has declined by nearly 50% since settlement. Big sagebrush is not a root-sprouting shrub; consequently, fire eliminates or creates patchy sagebrush habitat following burning. Although historic, low-intensity, infrequent fires killed encroaching conifers and created mosaic or patchiness within sagebrush communities, the size, intensity, and frequency of recent large fires has led to large-scale loss of sagebrush suitable for obligate wildlife including sage-grouse. I will present results from studies in Idaho, Oregon, and Wyoming that examined shrub-mediated structural characteristics, herbaceous understory, food resources, and sagebrush patch size, which are primary concerns for the effects of fire on restoration of sage-grouse habitats. Restoration of sagebrush habitats and populations of sagebrush obligates must focus on reducing the frequency and size of fire, controlling invasive species (especially annual grasses at lower elevations and encroaching conifers at higher elevations), and reestablishing big sagebrush and native perennial herbaceous plants.

Fire Effects on Reintroduced, Low-Elevation Bighorn Sheep

Oral Presentation

Evaluating wildlife response to burning provides key information on how fire-mediated habitat alterations impact reintroduced wildlife populations. We used GPS locations from 38 low-elevation bighorn sheep (Ovis canadensis) translocated to the Seminoe Mountains of south-central Wyoming in 2009 and 2010 and 24 bighorns captured in our study area in 2011 to investigate provisional impacts of prescribed and wildfire-mediated habitat alterations that burned ~24% of the study area in 2011 and 2012. We quantified home range distributional changes, resource selection, and survival of bighorn sheep from 2009 to 2013. Bighorns expanded home range distributions and increased proportional use of burned areas after fires; however, regression coefficients indicated no selection for fire-treated areas. Bighorn survival decreased >30% after fires in 2012 were accompanied by severe drought conditions suggesting prescribed burns that occurred during drought coincided with increased mortality through 2013. Our study suggests large-scale fires coupled with unfavorable climate conditions rendered bighorns unable to access adequate forage to meet nutritional requirements because they were unwilling to forego site fidelity. Because provisional impacts of fire-mediated habitat alterations on bighorn are highly dependent on ensuing vegetative recovery, consideration should be given to the timing, extent, and spatial coverage of prescribed burns.

Benscoter, Brian

Brian Benscoter is Assistant Professor of Wetland Ecology at Florida Atlantic University. In the past 15 years, his research on fire in peatlands has spanned North America from Alaska to the Everglades, focusing on feedbacks between plant community structure and fire behavior.

Novel fuel conditions invert the fire regime across low-latitude peatlands

Oral Presentation

Peatlands represent transitional landforms between terrestrial and aquatic ecosystems. Low-latitude (subtropical and tropical) peatlands account for more than 30% of the global wetland extent and their rich organic soils contain more than 4% of the global terrestrial C pool. Natural disturbances (wildfire, drought, storms) are an important influence on peatland health, although natural fire regime and ecology is variable across the region. Graminoid-dominated peatlands like the Florida Everglades have frequent, high intensity fires that maintain sawgrass communities and prevent woody encroachment, whereas the humid microclimates of Indonesian peat swamp forests make them resistant to burning, resulting in infrequent, low-intensity fires. However, climatic drying or anthropogenic drainage has in many cases inverted the ecosystem-fire relationship. Drying of coastal and inland graminoid wetlands has led to woody encroachment, reducing fine fuel loading and fuel flammability and suppressing fire behavior. Conversely, drainage of forested swamps has increased the flammability of aboveground and soil fuels, resulting in more severe and frequent wildfires. In both cases, altered fire regimes have compromised ecosystem resilience. We discuss the vulnerability of low-latitude peatlands to concurrent and synergistic effects of human and climate-induced fire regime shifts and consider implications for ecosystem management under changing ecological, environmental, and social pressures.

Bergeron, Yves

A specialist in forest ecology, Yves Bergeron has dedicated his career to studying the dynamics of the Canadian boreal forest. He has shown how Canada's boreal forest was controlled by fire and insect epidemics. He has helped develop new forest development approaches that are inspired by natural dynamics. He is currently professor at Université du Québec à Montréal and at Université du Québec en Abitibi -Témiscamingue. He holds an industrial and a Canadian chairs in sustainable forest management and he is member of the Royal Society of Canada since 2010

Spatio-temporal heterogeneity in the fire regime shifts following the Little Ice Age in Eastern boreal Canada

Oral Presentation

Continental-scale dynamics of boreal fire activity in North America has been recently shown to exhibit general increase in the number of fire-prone fire seasons and increased annual asynchronicity of reconstructed climatological fire hazard between western and eastern regions since the second half of 1800s. There are however concerns about (a) ability of such tree-ring reconstructions to adequately represent low frequency variability in fire activity and (b) temporal stability of reconstruction skill over century-long perspectives. In this study we analyzed changes in the landscape-level fire cycles in 18 areas across the boreal zone of Eastern North America and tested the hypothesis about non-synchronous changes in fire activity following the end of Little Ice Age (LIA). To provide a objective estimate of the timing of the regime shifts in the fire activity, we use regime shift detection algorithms developed by Reed (2000) on datasets originated from stand initiation maps (i.e. time-since-fire map data). Our results suggest (a) a decline in fire activity following the termination of LIA in central and eastern boreal Canada and (b) strong gradient in the onset of such decline, the sites in the south-west exhibiting the earlier decline in fire activity and sites in the north-east revealing later regime changes or no regime shifts at all. We argue that boreal fire activity have been exhibiting highly non- synchronous response to global climatic changes, which highlights the difficulty in providing global estimates of climate forcing upon forest fire activity and calls for better understanding of its regional controls.

Berleman, Sasha

Sasha A Berleman is a PhD Candidate studying fire ecology in the Ecosystem Sciences Division of UC Berkeley's Environmental Science, Policy, and Management Program.

Effects of Micro-scale Fire Treatments on Population Dynamics of Medusahead and Focal Species Fecundities

Poster Presentation

Medusahead (Elymus caput-medusae) is one of the most damaging invasive plants in North America. It is prolific, spreads quickly, is unpalatable to livestock, and significantly reduces species diversity. Research shows that prescribed fire can effectively manage medusahead, but some results have been mixed. We focus on micro-scale processes (one-square-meter), examining seedbank and seed-rain dynamics, and fires effect on abundance and fecundity for three focal species representing different functional guilds: native perennials (purple needlegrass), non-native forageable grasses (wild oat), and non-native invasives (medusahead). Our key objectives are to: (1) Understand effect of species cover and dominance on treatment success, and whether these may improve or hinder restoration objectives (2) See effect of fire on oat, needlegrass, & medusahead fecundities (3) Consider role of scale in treatment success through seed-limitation, and investigation of seed rain and seed bank We anticipate that this knowledge can help guide management decisions regarding the appropriate spatial scale of treatments (in this case, prescribed burns). The insight gained through this project could be particularly valuable to rangeland managers enacting Early Detection Rapid Response techniques to respond to plant invasion quickly. Given the challenges in planning large treatments, this research will improve managers ability to predict outcomes of planned treatments and make adjustments accordingly.

Berryman, Erin

Erin Berryman is a Research Ecologist at the US Geological Survey, Geosciences and Environmental Change Science Center, in Denver, Colorado. She is an ecosystem ecologist who is interested in the effects of forest disturbance on plant and soil function. She earned her Ph.D. in Forest Resources from the University of Idaho and worked for Colorado State University and the University of Colorado before joining the USGS in 2014. Her publications to date have highlighted the importance of tree mortality and drought on soil carbon dioxide release in western North American forests.

How does post-fire mulching affect forest regeneration and soil productivity? A controlled experiment

Oral Presentation

Wildfire puts multiple ecosystem values at risk. Yet, remediation often focuses on immediate erosion mitigation, with little consideration for competing, longer-term values of forest regeneration and soil productivity. We assessed tree seedling establishment, plant cover, soil nutrient availability, soil moisture, and organic matter turnover in response to three commonly-used post-fire rehabilitation mulch products (wood strands, wood shreds, and wheat straw) in a replicated, randomized block design. Treatments were established immediately post fire in an area burned with high severity in the 2012 High Park Fire in the Colorado Rocky Mountains and sampled for three years. All mulch types increased soil moisture retention during summertime dry spells. All mulch, except for wheat straw, increased tree seedling counts compared to unmulched treatments after three years. Mulch type mattered: wheat straw and wood shreds decreased plant-available N compared to the unmulched control, and wheat mulch increased plant cover. Thus, mulch may simultaneously promote and diminish ecosystem values at risk post-fire. No single mulch type is a panacea for post-fire recovery, and each type of mulch examined here may have both benefits and drawbacks for use in rehabilitating burned landscapes.

Beyers, Jan

Jan Beyers is a research plant ecologist at the Forest Service PSW Research Station in Riverside, California. She earned her bachelor's degree in Environmental Studies-Biology from Whitman College and Ph.D. in Botany from Duke University. Her Forest Service research has focused on the effectiveness of post-fire emergency watershed stabilization treatments, ranging from grass seeding to aerial hydromulch, and on fire ecology of chaparral and related plant communities. The use of native plant materials for stabilization and restoration is also a long-standing interest. She currently serves as team leader for the Environmental Fire Science Team in the Fire and Fuels Program.

Chaparral recovery after a short-interval reburn

Oral Presentation

Chaparral vegetation is adapted to fire, but the natural fire regime includes long fire return intervals (40-100 years). Increasing anthropogenic ignitions in southern California can mean that some chaparral stands reburn at far shorter intervals. Obligate-seeding shrub species may not mature enough to have contributed to the soil seed bank before another fire occurs, leading to "immaturity risk" and the prospect of plant community change. We examined vegetation recovery after the human-caused Silver wildfire reburned plots we had established after the Esperanza fire 7 years earlier. We found that most reburned plots contained no seedlings of the obligate-seeder cupleaf desert lilac (Ceanothus perplexans) and very few seedlings of chamise (Adenostoma fasciculatum), although chamise did resprout; however, some plots had abundant reproduction of the fire-follower bush poppy (Dendromecon rigida) and thick-leaved yerba santa (Eriodictyon crassifolium), an opportunistic disturbance-follower. Cover of non-native annual brome grasses was much higher in reburn plots than in plots burned only in the Silver fire. Although wholesale type-conversion of the chaparral vegetation did not occur, two fires in short succession began a process of plant community change that could be pushed closer toward type-conversion if another fire occurs in the same area within the next 10 years.

Bhatta, Mamta

Mamta Bhatta is the assistant Environmentalist at Multi-Disciplinary Consultancy Pvt. Ltd- Kathmandu, Nepal. She completed MSc in Environmental Science from Tribhuvan University, Nepal. She worked as a researcher on impact assessment of fire on plant-diversity of Langtang National Park granted by WWF-Nepal (2010) and carbon assessment of soil granted by Ministry of Forest and Soil Conservation (2012). She is recipient of Dr. Dayanand Bajracharya Research Award from Nepal Academy of Science and Technology (NAST), Government of Nepal in 2014 for contribution on forest fire impact assessment on plant diversity and innovating satellite imagery mapping in burned area in Langtang National Park and Chitwan district of Nepal (2014). Her area of interest is research on fire ecology.

Forest Fire Risk in Chitwan by Using RS and GIS

Oral Presentation

* Forest Fire Risk in Chitwan by using Remote Sensing and GIS Bhatta Mamta Dhakal Susmita and Maskey Rejina Abstract Forest fire in Terai and Mid-Hill region of Nepal burnt about 400,000 ha of forest annually. MODIS data of Chitwan district revealed the number of fire events crossed average of 250 per year. Research was focused to assess the fire frequency and spatial extension. Fire frequency and biophysical factors were used to assess the fire risk. MODIS hotspots were used for fire frequency. Landsat images were used for spatial extension mapping by normalized burn ratio. Fire risk map was obtained by assigning subjective weight to influencing bio-physical factors class. Risk map was validated with 2001, 2009 and 2013 fire scar map and MODIS hotspots. Out of 3341 total fire events, 90% fire events occurred in protected forest only. Fire scars were mapped from Landsat with no major changes as 11.5%, 14.4% and 14.79% in 2001, 2009 and 2013 respectively. Fire frequency was highest in Shorea robusta dominated forest. Higher frequency zone was compatible with very high risk zone. Fire was concentrated in Shorea robusta forest, grassland, Chure forest, mixed forest of Mahabharat region and riverine forest in decreasing order. Keywords: Chitwan, frequency, risk and forest

Forest Fire Risk in Chitwan by using Remote Sensing and GIS

Poster Presentation

Forest Fire Risk in Chitwan by using Remote Sensing and GIS Abstract Forest fire in Terai and Mid-Hill region of Nepal burnt about 400,000 ha of forest annually. MODIS data of Chitwan district revealed the number of fire events crossed average of 250 per year. Research assesses the fire frequency and spatial extension. Fire frequency and biophysical factors were then used to assess the fire risk. MODIS hotspots were used for frequently affected area. Landsat images were used for spatial extension mapping by normalized burn ratio. Fire risk map was obtained by assigning subjective weight to influencing bio-physical factors class. Risk map was validated with 2001, 2009 and 2013 fire scar map and MODIS hotspots. Fire scars were mapped from Landsat with no major changes as 11.5%, 14.4% and 14.79% in 2001, 2009 and 2013 respectively. Fire frequency was highest in Shorea robusta forest. Higher frequency zone was compatible with very high risk zone. Fire was concentrated in Shorea robusta forest, grassland, Chure forest, mixed forest of Mahabharat region and riverine forest in decreasing order. Keywords: Chitwan, frequency, risk and forest

Bird, Douglas

Douglas Bird is Assoc Professor of Anthropology at Penn State University. He has spent many years living in remote indigenous communities, working mostly with the Traditional Owners of a large region of Australia's Western Desert. His research focuses on ecological relationships between people, their livelihood decisions, and biodiversity. In addition to work on anthropogenic fire (see PNAS), he focuses on the dynamics of subsistence practices and social organization (e.g. Bird et al. 2013. Megafauna in a continent of small game: archaeological implications of Martu camel hunting in Australia's Western Desert. Quaternary International 297:155-166).

Co-evolutionary dynamics and anthropogenic pyrodiversity in Australia's Western Desert.

Oral Presentation

During the mid-20th century Australia's Western Desert experienced a shift in fire regimes coincident with the loss of most medium sized endemic mammal populations. Many scholars have suggested that these changes are linked to a dramatic reduction of indigenous burning when Aboriginal populations were removed from their homelands and concentrated in missions and pastoral stations at the desert margins. In the late 20th century many indigenous families returned permanently to their homelands and re-established certain subsistence practices involving patch mosaic burning of spinifex grasslands. This paper uses a dataset of 15 years of quantitative observations of foraging strategies and land use among Martu - the Traditional Owners of the north west region of the Western Desert - to investigate the relationship between livelihood practice, endemic and invasive fauna, and patterns of vegetative pyrodiversity. These observations are combined with analyses of satellite imagery to track the extent of contemporary Aboriginal burning throughout desert Australia and test hypotheses concerning the role of pyrodiversity in buffering climatically driven cycles of wildfire throughout the region.

Blackburn, Marianne

Marianne E Blackburn Student Intern USGS, University of Colorado Marianne was one of only ten students in Colorado selected for a competitive summer research internship through the University of Colorado Boulder and funded by the National Science Foundation. She presented her research at a symposium at University Corporation for Atmospheric Research (UCAR). The work she has done this summer on how surface fuels have changed in ponderosa pine forests along the Colorado Front Range where there has been significant infestation of the mountain pine beetle will also be considered for publication.

Changes in Surface Fuels and Regeneration Following the Mountain Pine Beetle Epidemic in Ponderosa Pine Forests Along the Colorado Front Range

Student Poster Presentation

An epidemic outbreak of the mountain pine beetle (Dendroctonus ponderosae; MPB) has altered many aspects of forest structure across millions of acres of Rocky Mountain forests since 1996. We measured changes in surface fuels and seedling density in ponderosa pine (Pinus ponderosa) forests along the Colorado Front Range during (2009-11) and after (2015) the peak of the epidemic in this area. We surveyed 3 sites which had experienced “high” MPB impacts and 3 with “low” MPB impacts. Fine woody debris (FWD) increased significantly (8-10 times) in all sites by 2015 ($p=<0.0001$). Similarly, coarse woody debris (CWD) increased ($p=0.006$) at all sites, but to a lesser extent than FWD. Density of seedlings < 15.24 cm increased considerably, from 0 to 1 seedling/m2, but density of larger seedlings did not change. Although sites with both low and high MPB impacts showed similar increases in FWD and small seedlings, there was a trend for more CWD and fewer seedlings on high-impact sites. Overall, our results suggest that the MPB epidemic has not caused major changes in fuel loads and regeneration in the past 5 years. However, expanded survey efforts may detect additional implications for wildfire hazard over time as more dead trees fall.

Blankenship, Kori

Kori Blankenship is a fire ecologist with The Nature Conservancy. She holds degrees in Geography from Western Washington University. Kori worked as a GIS specialist at the U.S. Forest Service Fire Sciences Lab in Missoula, MT and as a wildland firefighter for the U.S. Forest Service and National Park Service. Kori began work with the LANDFIRE program in 2004 and since that time has served as a member of the mapping, vegetation modeling and technology transfer teams. Her current focus is on helping users successfully apply LANDFIRE products to solve conservation and land management problems.

1 year, 5 people, 2,000 models: the story of one team’s effort to improve understanding of fire and vegetation ecology

Poster Presentation

Over the next year, five members of a Nature Conservancy team will lead a collaborative effort to improve LANDFIRE’s vegetation dynamics “library” – a comprehensive collection of nearly 2,000 detailed descriptions of pre-settlement vegetation communities. Each description is linked to a quantitative model that simulates the dynamics of growth and disturbance in the community over time. The model/description bundle has informed forest plan revisions, land management planning, climate change analyses and restoration needs assessments for nearly a decade. The library is also the foundation for LANDFIRE’s fire regime and vegetation departure products. To remain relevant, this body of knowledge must be updated as understanding of vegetation communities and their dynamics evolves. For this reason, the LANDFIRE team will lead a review effort in the coming year. The goals are to incorporate new information where available, correct errors, engage a broad spectrum of reviewers with diverse knowledge, and support the work of the wildland fire, land management and conservation communities by offering quality ecological information. This poster will lay out the review process, examine potential challenges, list desired outcomes and make a call to action for the community to engage in this effort.

Bloom, Trevor

I am a graduate student at Western Washington University in Bellingham, WA. My current research interests are the impacts of climate change and wildfire on high elevation ecosystems. I love to travel, climb, adventure, and conduct quality science to inform conservation. Climb-it-Change is the public outreach component of my MSc degree in Biology, and I am to spread awareness about current climate change issues. I am also the president of the Western Washington University S.A.F.E. Chapter.

Impact of climate change and wildfires on a high elevation flower in the Rocky Mountain Floristic Region

Oral Presentation

High elevation plants are disproportionally affected by climate change, and species level extinctions are expected over the next century as the amount of available high-subalpine/alpine habitat in Western North America decreases. In addition to the direct effects of climate-driven habitat loss, high elevation plants must also respond to indirect effects such as changes in disturbance regimes. One of the most tangible indirect effects is the increase in wildfire frequency and intensity in regions that fire was previously rare or absent, including the high subalpine and alpine. My research investigates the response of Saxifraga austromontana, a wildflower endemic to the Rocky Mountain Floristic Region, to direct effects of climate change and the indirect effect of increased wildfire frequency and intensity. This is the first non-timber based study on the combined impacts of climate change and wildfire on a high elevation species. My novel approach involves Species Distribution Modeling (SDMs), Global Circulation Models (GCMs), the Monitoring Trends in Burn Severity (MTBS) Burn Severity Mosaics, the Canadian Wildland Fire Information System (CWFIS) Datamart, and a three-month field experiment. This research will further our understanding of the combined influences of climate change and wildfire on high elevation ecosystems. Forecasting changes in the distribution of high elevation species is critical for informing scientists and managers on the best strategies for preserving critical habitat and rare species.

Bontrager, Jonathan

Jonathan is currently a Master's student in the Forest, Rangeland, and Fire Sciences Department at University of Idaho. Originally from Northern Michigan, Jonathan has been living in the West since 2011. His research focuses on understanding how post-fire rehabilitation techniques affect long-term vegetation recovery.

Long Term Vegetation Recovery Following Post-Fire Mulching

Poster Presentation

Aerial straw mulching is increasingly being used post fire to stabilize soil, protect values, and promote vegetation recovery in areas burned with high severity. Although wheat straw mulching is one of the most common post-fire rehabilitation treatments, we know little about the long-term effects (over 10 years) on vegetation recovery. This study aims to assess the long-term differences between mulched and unmulched areas in high severity burns areas by collecting tree seedling and understory vegetation richness, cover and diversity data for 5 fires in ponderosa and dry-mixed conifer forest types. Species diversity and richness were generally higher on mulched sites. We found that conifer seedling density was lower on mulched sites, 116 seedlings per hectare compared to 759 on unmulched sites on the Hayman Fire in Colorado. We predict that trees will be taller on mulched sites, possibly due to initial mulch cover and reduced inter-seedling competition. This study helps understand long-term vegetation recovery after large wildfires, especially whether physically altering immediate post-fire conditions with mulch has long-term effects on what vegetation communities persist. Managers will be able to better weigh the long-term implications of mulching with short term benefits of erosion control.

Booth, Emily

Emily Booth is a Ph.D. candidate in the Department of Integrative Biology at the University of Texas at Austin, where she co-founded the Central Texas chapter of SAFE in 2012. Her dissertation research is an investigation of the effects of wildfire and restoration treatments in the Lost Pines region of central Texas. She received her M.S. in Plant Biology and Conservation from Northwestern University and the Chicago Botanic Garden, where she studied potential effects of climate change on herbaceous species on the Colorado Plateau.

Post-Wildfire Legacy Effects in a Pine-Oak Woodland

Student Poster Presentation

The Lost Pines region of Texas has the westernmost stands of loblolly pine (Pinus taeda) in the United States. In September 2011, during a record drought, a wildfire killed almost all of the trees in the Lost Pines, including Bastrop State Park. We investigate the effects of soil type, burn severity, and canopy cover on post-wildfire regeneration of three locally common species: loblolly pine, an obligate-seeding species, and sand post oak (Quercus margaretta) and yaupon (Ilex vomitoria), both of which produce basal re-sprouts. Fifty-six plots within the Park were surveyed using protocols from the National Park Service Fire Monitoring Handbook (FMH) between 1999 and 2015. Yaupon and oak re-sprouted in significantly greater numbers in sandy soils and less severely burned plots. Pine seedling counts were significantly greater in less severely burned plots, where greater live canopy cover provided a seed source. Legacy effects of year-to-year stem count were the strongest predictor of subsequent counts for all three species. This suggests that immediate post-fire events and factors affecting short-term post-wildfire recruitment are critical in determining long-term vegetation trajectories; after an initial recruitment period, more aggressive approaches to restoration may be necessary to change plant community trajectories where desired.

Borala Liyanage, Ganesha

Ganesha Liyanage is a PhD candidate at the University of Wollongong. Her main research interests are seed ecology and ecophysiology. Her PhD research is focused on physical dormancy variation in native Australian plant species and their ecological role in fire-prone ecosystem. Her manuscript recently accepted to publish in Annals of Botany, entitled Intra-population level variation in thresholds for dormancy-breaking temperature, in which she and Dr. Ooi presented research conducted on physically dormant species from fire-prone ecosystem in South-eastern Australia.

Seedling performance in the post-fire environment: effect of seed dormancy-breaking temperature thresholds on subsequent life history stages

Oral Presentation

In fire-prone ecosystems, the seeds of species with physical dormancy show intra-population variation in dormancy-breaking temperature thresholds, with some losing dormancy after low temperatures and others requiring temperatures generated by hot fires to break dormancy. Post-fire resource availability after low severity fire, or in vegetation gaps during inter-fire periods, tends to be lower than after high severity fire, because available resources are for both seedlings and unburnt vegetation. We suggest that differences in seedling performance could be found between seeds with different dormancy thresholds, due to the selective influence of the environment each would primarily emerge into. Seed and seedling characteristics of low and high threshold seeds for each of two physically dormant species, Viminaria juncea and Bossiaea heterophylla, were compared in a competition experiment; either alone in individual pots (control), or with three Acacia linifolia seedlings (competition). Mean seed mass did not differ significantly between seeds with different thresholds, however, cotyledon opening of seedlings was faster for low threshold seeds of both species. This advantage continued after four months for Bossiaea. Our results confirm that differences in dormancy-breaking temperature thresholds between seeds can play a role in determining subsequent seedling performance, allowing seedlings to cope with differing post-fire environments.

Boring, Lindsay

Dr. Lindsay Boring is Director of the Joseph W. Jones Ecological Research Center at Ichauway in southwest Georgia, which is sponsored by the Robert W. Woodruff Foundation. As Director, Boring supervises the stewardship of the 30,000 acre Ichauway site, graduate student co-sponsorship programs, natural resource education and outreach to landowners, students, policy-makers and public agencies, and long-term scientific research with 40 research staff. His personal research interests include topics in forest ecology related to forest management, including fire ecology, productivity and biogeochemical cycles. He currently serves on the graduate faculty of the University of Georgia and the University of Florida.

Frequent Fire Forest Ecosystems: Developing a Common Understanding of Forest Structure and Function

Oral Presentation

ABSTRACT--Frequent-fire adapted forest ecosystems in North America remind us of the vast forest landscapes prior to the widespread harvest of virgin timber and the withdrawal of fire in the woods. The area of fire-adapted forest ecosystems is a fraction of its former extent, with a concomitant loss of flora and fauna that depended upon frequently-burned open forests and woodlands. An expanded program of active forest management and restoration is needed in longleaf pine-dominated forests of the Atlantic Sandhills and the Atlantic and Gulf Coastal Plains; in shortleaf pine-dominated and oak-dominated forests of the Appalachians, the Cumberland Plateau, and the Interior Highlands; in ponderosa pine forests of the Rocky Mountains and the Intermountain West; and in other mixed conifer forests throughout the western United States. The development of adaptive management practices to mitigate and restore frequent-fire adapted forests is urgent, especially given climate change predictions. Adaptations include silvicultural practices, use of prescribed fire, approaches to wildlife management, and ecological restoration of understory flora. Such practices can maintain forest ecosystem resistance to potential disturbances, provide forest ecosystem resilience following disturbance, and minimize effects on ecological goods and services related to productivity, carbon storage, hydrologic regimes, biodiversity and other wildlife values.

Bourgeau-Chavez, Laura

Laura L. Bourgeau-Chavez, Research Scientist, Michigan Technological University. Dr. Bourgeau-Chavez has been studying boreal forests, including peatlands and wildfire, using an integration of field data and remote sensing for over 20 years. She has developed methods for mapping peatland types using a fusion of optical and radar data and methods for retrieving fuel moisture for fire danger prediction using polarimetric radar data.

Vulnerability of North American Boreal Peatlands to Interactions between Climate, Hydrology, and Wildland Fires

Oral Presentation

Boreal peatlands represent a large reservoir of soil carbon that is becoming increasingly vulnerable to fire due to climate change. Wildfire activity in peatlands could cause a shift in post-fire trajectories, and peatlands may become net sources of C to the atmosphere. North American boreal peatland sites of Alaska, Alberta Canada, and the southern limit of the boreal ecoregion (Michigan's Upper Peninsula) were the focus of a recently completed study to better understand the fire weather, hydrology, and climatic controls on boreal peatland wildfires. The goal of the research was to reduce uncertainties of the role of boreal peatland ecosystems in the global carbon cycle and to improve carbon emission estimates from boreal wildfires. The landscape scale quantification of wildfire effects in boreal peatlands required development of three important mapping and monitoring capabilities specific to peatlands including: 1) methods for mapping of peatland type (e.g. bog vs. fen) and level of biomass (herbaceous, shrub, forest dominated); 2) algorithms to map burn severity to the peat surface; and 3) algorithms for mapping pre- and post-burn soil moisture with synthetic aperture radar data. The mapping methods and results of the carbon emissions model CanFIRE will be presented.

Bowden, Philip

Phil Bowden - US Forest Service Pacific Southwest Region Fuels Planner Phil attend Michigan Technological University and graduated with a BS in Forestry in 1979. In 1978 Phil got a temporary job with the Black Hills National Forest in South Dakota working on the timber crew. Phil returned there for a few seasons. Eventually Phil landed on the White River National Forest in Colorado. Phil spent the next 22 years working there: Administering timber sales, cruising timber, fighting fires, lighting more fires, and learning about fire. Phil was Zone Fire Management Officer for 10 years. Phil is currently in California.

Using benefits analysis in pre-planning the response to wildfires in the Southern Sierra National Forests (spatial fire management planning)

Oral Presentation

This case study focus on the use of the Effects Analysis found in the publication A wildfire risk assessment framework for land and resource management (GTR-315) to inform Forest and Spatial Fire Management Planning on the Inyo, Sequoia and Sierra National Forests. Analysis outputs were used to help define strategic fire management zones in Forest Plans. These strategic fire management zones will aid decision makers and fire managers in determining where the management of wildfires is likely to benefit natural resources. Since these zones are informed by the wildfire effects analysis many of the uncertainty of choosing to manage a wildfire primarily for resources objectives have been addressed. Forest Plan standards and guidelines in the zone with the most likely beneficial outcomes are geared to change the current default fire suppression response to a more holistic and risk informed approach.

Bowman-Prideaux, Chris

Chris Bowman-Prideaux received his M.S. from California State University, Northridge and is currently a Ph.D. Candidate in the College of Natural Resources at the University of Idaho. His research interests include understanding how disturbance and human activity affect plant communities, with a focus on plant invasions.

Adding Fuel to the Fire: The Contribution of Perennial Bunchgrasses in Altering Fire Regimes in the Great Basin

Oral Presentation

The historic fire return interval in Wyoming sagebrush ecosystems has been estimated in the hundreds of years; however, the current fire regime has shifted to short fire return intervals with some areas burning six times in the past 60 years. Invasive annual grasses (e.g. Bromus tectorum) are frequently cited as the primary reason for this fire regime shift by creating fine, continuous fuels; however, high densities of bunchgrasses may also contribute to continuous, fine fuel loads. We used data detailing fire and BLM rehabilitation treatment history to assess the impact of the shift in vegetation from sagebrush to nonnative perennial bunchgrass communities on fire return and number of fires. We extracted fire and rehabilitation history from randomly selected sites across 209,000 ha and analyzed their relationship to plant cover and density at 68 sites using generalized linear models. Bromus tectorum cover did not vary with fire number or time since sagebrush removal, but Agropyron cristatum cover increased with time since planting and with fire number. Our data suggest that planting fire resilient species, such as A. cristatum, may further shift fire regimes in southern Idaho rangelands and put adjacent intact native vegetation at risk of burning in future fires.

Bragg, Tom

Tom Bragg is a Professor of Biology at the University of Nebraska at Omaha (UNO) and Director of UNO's Glacier Creek Preserve and T.L. Davis Preserve. Courses taught include Ecology, Plant Ecology, Fire Ecology, and Communities & Ecosystems. Dr Bragg's research focuses on the effects of fire season and frequency on plant diversity in the North American Tallgrass Prairie and the Nebraska Sandhills Prairie with additional research on fire effects on the desert grasslands of Western Australia.

Fire-return interval and mulga (Acacia aneura) regeneration in Western Australia: Implications for prescribed burning.

Oral Presentation

Twenty-six burnt mulga (Acacia aneura) stands were evaluated from 2003 to 2012 in the Gibson Desert and eastern Gascoyne–Murchison region of Western Australia to assess the effect of fire interval on mulga regeneration. Tree-ring analysis and Landsat satellite imagery identified mulga stands with fire intervals ranging from 3 to 52 years. Fire-return intervals of less than 20 years produced 2 to 3-year-old seedlings in numbers lower than 50%

of the original adult stand population (average juvenile-to-adult ratio = 0.49), the minimum number needed for population replacement. Of the 26 stands sampled, six had reburnt within 3 to 10 years of the previous burn, apparently due to increased plant growth associated with higher rainfall. Summer fires were more frequent (24 of 35 fires) and larger (median fire size = 150 km2) than spring fires (median fire size = 91 km2). This study details the role of fire in affecting diversity and vigor of the mulga–Triodia ecosystem, where a minimum fire-return interval of 26 years is needed to maintain mulga stands. With mulga supporting higher overall plant diversity, a broader view of these results, and those conducted elsewhere, emphasizes the need to understand plant community dynamics when using prescribed burning for species diversity.

Bragg, Don

Dr. Don C. Bragg is a Research Forester with the Southern Research Station of the USDA Forest Service, and is also currently the Editor-in-Chief of the Journal of Forestry.

Wanted: case studies on frequent fire in conifers for a planned book on open forest ecosystems

Oral Presentation

Historically, open forest ecosystems were globally abundant, but they have diminished dramatically under fire exclusion, forest densification, agricultural conversion, development, fragmentation, and invasion of non-native species. Reestablishment of frequent fire is being used to restore open loblolly pine (Pinus taeda) forests for a number of ecosystems in southern Arkansas. These examples, installed on various ownerships with differing objectives, suggest how implementation strategies must be tuned to their own unique circumstances; there is no one-size-fits-all recipe on managing open pine forests using frequent fire. These case studies also are offered as a solicitation for contributions by researchers and managers of examples for a planned edited volume that takes an ecoregional approach to open forest ecosystem restoration. We envision the primary audience of this proposed book will be managers, but it will have foundations in science and policy appealing to researchers, policy makers, and students. While many of our anticipated examples will come from open pine ecosystems in the United States, we expect examples from fire-prone environments across the world. In addition to case study descriptions (on established demonstrations), we also are seeking people willing to share their experiences through collaboration on other fire-related topics, including any suggestions about book contents.

Brando, Paulo

Dr. Brando is a tropical ecologist whose research explores the vulnerability of terrestrial natural ecosystems to repeated disturbances and prolonged degradation. He aims to inform the general public and policy makers about the potential negative influences of climate and land use change on tropical ecosystems. His research combines field manipulation experiments, statistical and dynamic vegetation models, and remote sensing.

Fire-induced tree mortality in Amazônia: what do we really know?

Oral Presentation

Interactions among droughts, heat waves, logging activities, and forest fragmentation may intensify fires in Amazônia by altering forest microclimate and fuel dynamics. As climate and land use change continue, widespread fires and associated forest degradation may become even more common in the near future. To quantify some of the potential effects of such global changes on fire-induced mortality of Amazonian trees, we conducted experimental fires across a wide range of climatic conditions in southeast Amazônia. Our results show that while experimental fires conducted during non-drought years apparently fell at the low end of the spectrum of intensity and severity, those conducted during dry-warm climatic conditions caused abrupt, non- linear forest responses (e.g., 4-folder increases in tree mortality). This contrasting pattern in fire intensity and severity points to synergies between fuel amount and climate that can create threshold conditions for high-intensity fires

Brantley, Steven

Steven Brantley is an ecohydrologist at the Joseph W. Jones Ecological Research Center in Newton, Georgia, USA. His research examines how vegetation structure and function affect stand-level rainfall partitioning and how stand-level water use impacts landscape-scale hydrologic processes.

Water yield tradeoffs of promoting carbon sequestration in frequent-fire forest ecosystems of the southeastern United States

Oral Presentation

Forests of the southeastern US serve as strong carbon (C) sinks, making their management an important tool for climate change mitigation. However, managing forests to maximize C sequestration may have tradeoffs for regional water supplies. We examined shifts in forest cover and variations in C sequestration and evapotranspiration (ET) rates among forested ecosystems to determine how changes in forest cover have impacted water yield. The southeastern US was historically dominated by the frequent-fire longleaf pine (Pinus palustris) savanna ecosystem. This ecosystem is a very weak C sink under its historical disturbance regime and is characterized by relatively low ET (≤ 700 mm yr-1). Much of this ecosystem has been replaced by unmanaged fire-suppressed hardwood forest or softwood timber production. These forests are strong C sinks (NEE ≥400 g m-2 yr-1) but also have relatively high ET rates (780–995 mm yr-1). While shifts in forest cover have increased C sequestration in the region, these changes may also be partially responsible for reduced water yields observed in the past 40 years. Future policies that promote C sequestration and/or penalize land management practices that use frequent prescribed fire may add further stress to the regional water supply in the Southeast.

Brennan, Teresa

Teresa Brennan is an ecologist with the United States Geological Survey at the Sequoia and Kings Canyon Field Station in Three Rivers, CA. Her field of study is fire ecology in the chaparral dominated landscapes of Southern California with recent publications assessing the effectiveness of fuels treatments and defensible space in these highly flammable systems.

Mastication in chaparral, new ideas to chew on.

Oral Presentation

Abstract. Mechanical fuel treatments are a common pre-fire strategy for reducing wildfire hazard that alters fuel structure by converting live-canopy fuels to a compacted layer of dead-surface fuels. The current knowledge concerning their effectiveness, however, comes primarily from forest-dominated ecosystems. Our objectives were to quantify and compare changes in shrub-dominated chaparral following crushing, mastication, re-mastication and mastication-plus-burning treatments and to assess treatment longevity. Results from ANOVA identified significant differences in all fuel components by treatment type, vegetation type and time-since-treatment. Live-woody fuel components of height, cover, and mass were positively correlated with time-since-treatment, whereas downed-woody fuel components were negatively correlated. Herbaceous fuels, conversely, were not correlated and exhibited a five-fold increase in cover across treatment types in comparison to controls. Average live-woody fuel recovery was 50% across all treatment types and vegetation types. Differences in recovery between time-since-treatment years 1-8 ranged from 32%-65% and exhibited significant positive correlations with time-since-treatment. These results suggest that treatment effectiveness is short-term due to the rapid re-growth of shrubs in these systems and compromised by the substantial increase in herbaceous fuels. Consequences of not having a full understanding of these treatments are serious and leave concern for their widespread use on chaparral-dominated landscapes.

Brennan, Amy

Ms. Amy Brennan is a Graduate Student in the Arthur Temple College of Forestry and Agriculture at Stephen F. Austin State University. She obtained her BS in Forest Recreation from SFA in May of 2014, and began her graduate studies that summer.

Determining Public Perceptions toward Wildland Fire in the Veluwe Region of the Netherlands

Oral Presentation

The Netherlands, a country showing warmer and drier weather patterns, is facing a growing threat of wildfires. The purpose of this study is to identify public perceptions toward wildland fire in the forested Veluwe region of the country. The Dutch have little experience with wildland fires or fire as a management tool, and due to the lack of any significant historical context of wildfires, the assumption is that the Dutch do not see fire as an immediate threat. A collaborative effort between Stephen F. Austin State University and the Instituut Fysieke Veiligheid, the Dutch public safety agency, has created and distributed a survey that will reveal and quantify public opinions and perceptions regarding wildland fire and public expectations of government agencies in the event of a wildfire. Over 500 surveys were completed, and valuable insight into public perception of wildlfires was obtained.

Briggs, Jennifer

Jenny Briggs is a Research Ecologist at the Geosciences and Environmental Change Science Center of the US Geological Survey in Denver, Colorado. She has initiated and contributed to several important collaborations among forest scientists and managers, notably involving the Front Range Collaborative Forest Landscape Restoration Project and the Southern Rockies Fire Science Network.

How did fuel reduction treatments and prescribed fire affect ponderosa pine forests' resilience to a mountain pine beetle epidemic in Colorado?

Oral Presentation

The effectiveness of forest management actions is sometimes challenged by natural disturbance processes such as insect epidemics or wildfire. In ponderosa pine forests along the Colorado Front Range, we investigated whether the previous management of stands influenced the level of mortality they experienced in an epidemic outbreak of the mountain pine beetle (MPB) between 2009-11. We conducted annual surveys in stands (> 10 ha) at 31 sites that had been managed for fuel reduction (thinning; n = 8 stands); prescribed fire (n = 8); thinning followed by prescribed fire (n = 7); and no management in ~ 30 yr (n = 8). We inspected every tree in 4-ha monitoring plots and collected data on stand characteristics in five 0.02-ha sub-plots per site. Mortality varied across our 250-km study transect, ranging from 58% to 0% of stand basal area (BA) killed by 2011. Overall, managed stands experienced significantly lower mortality than did unmanaged sites (p = 0.02) but the effect of management type (i.e. thinning, burning, or both) was not significant. On unmanaged sites, greater proportions of small-diameter trees (< 10 cm at breast height) remained after the epidemic. Our results suggest tradeoffs in terms of the short- vs. longer-term resilience of managed vs. unmanaged stands to disturbance by MPB and potential future wildfire.

Bright, Benjamin

Benjamin C. Bright received a bachelor's degree in geography, emphasizing geographic information systems, from Brigham Young University in 2009. He received a master's degree in environmental science from the University of Idaho in 2011. He now works as a geographer for the United States Forest Service at the Forestry Sciences Laboratory in Moscow, Idaho. His current research focuses on using remote sensing technologies to study and map forest vegetation, especially following disturbance.

Examining patterns of vegetation recovery following wildfire using Landsat time series analysis

Oral Presentation

Studies investigating vegetation recovery a decade or longer post-fire are less numerous than those investigating fire effects more immediately post-fire. Such studies can benefit land managers who need to know long term effects of wildfire on vegetation across large areas. Time series analyses that make use of the Landsat record, such as LandTrendr (Kennedy et al. 2010), have been shown to be effective at capturing wildfire effects on vegetation disturbance and recovery. LandTrendr derivatives include quantitative metrics of the year, magnitude, and duration of disturbance, as well as the magnitude and duration of subsequent recovery. Here we use LandTrendr to characterize vegetation recovery trends for 7-12 years following large wildfires in six study areas: southern California, central Colorado, western and northwestern Montana, western South Dakota, and southeastern Washington. LandTrendr trajectories generated for every pixel are generalized at the patch level as defined by burn severity polygons defined by Monitoring Trends in Burn Severity (MTBS) images of one-year post-fire conditions. We examine vegetation recovery trajectories with respect to study area, vegetation type, burn severity, topography, climate, distance from roads, presence of post-fire treatments, and distance to the fire perimeter or unburned islands, which can serve as seed sources.

Brooks, Bjorn-Gustaf

Bjorn Brooks ORISE Fellow Eastern Forest Environmental Threat Assessment Center USDA Forest Service Bjorn Brooks joined the Eastern Threat Center as an ecologist in 2014. His current work tests for new ways to use satellite remote sensing to examine the capacities of forest ecosystems to endure disturbances of different kinds. His past work on atmosphere-biosphere carbon exchange has helped to incorporate new observations useful for understanding forest carbon dynamics from inadequately represented areas of the US Mountain West (Brooks et al., 2012, Atmospheric Chemistry and Physics).

Information Theory applied to wildfire mediated succession

Oral Presentation

Ecosystem development is subject to complex interactions among macroscale environmental drivers confounded with finer scale disturbances. For example, broad climatic and physiographic factors constrain forest species composition and productivity, which are further shaped by, infrequent, but potentially severe, wildfires and other disturbances. Direct effects of wildfires on seedling establishment, corridor boundaries, successional development and other processes occur within a broader context to create a tapestry of forest conditions. Distinguishing disturbance-driven changes in ecosystem structure and productivity from change regulated by more fundamental environmental conditions is essential to understanding landscape dynamics and crafting management options for restoring or enhancing resiliency. We present new work using NDVI data from MODIS analyzed using information theory metrics (IT) on a year to year basis to track phenological changes in vegetation development across the conterminous US. These IT metrics summarize the aggregate behavior of more than 140 million points across the landscape covering nearly 15 years of vegetation change in response to continental and local drivers. The resultant patterns suggest a continuum of tradeoffs among productivity, adaptive capacity, resiliency, and other landscape-level attributes shaped by multiscale drivers. An information-theoretic approach offers a practical and powerful new way to understand wildfire induced changes in forested landscapes.

Brose, Patrick

Patrick Brose has been a research forester with the USDA Forest Service, Northern Research Station since 2000. His primary interest is the role of fire in eastern oak forests and he has published and presented extensively on this topic. One of his most recent publications is the Fire-Oak Synthesis Guidebook published in 2014 by the Northern Research Station.

A Meta-Analysis of the Fire-Oak Literature of Eastern North America: Does the Fire-Oak Hypothesis Make Sense?

Plenary Talk

The fire-oak hypothesis postulates that fire (1) has been part of the landscape of eastern North America for millennia due to the cultural burning practices of American Indians and European settlers, (2) oaks possess several characteristics that give them a competitive advantage in a periodic fire regime, (3) the cessation of that regime is one of the major factors in current oak regeneration difficulties, and (4) prescribed fire can be used in some situations to help regenerate oak forests. We tested this hypothesis via a thorough review of 187 fire-oak papers and a meta-analysis of the data contained in 58 fire-oak regeneration publications. We found the hypothesis to be well supported by the literature. Prior to the early 1900s, fires occurred in eastern oak forests approximately once a decade. Differences in silvical characteristics between the oaks and mesophytic hardwood species gave the oaks survival and growth advantages in this periodic regime. The cessation of periodic fires in the early 1900s strongly correlated with the beginning of widespread oak regeneration difficulties. Utilizing prescribed fire at key times in the oak regeneration process can help promote oak reproduction and sustain oak forests into the future.

Brouwer, Nienke

Ms. Nienke Brouwer is a junior researcher at the Instituut Fysieke Veiligheid, the Netherlands. She obtained her BSc in Nature and Landscape technique at the University of applied sciences Larenstein, the Netherlands in 2013.

Fuel research in the Netherlands and the UK

Oral Presentation

The Dutch wildfire spread model has been in use in the Netherlands since 2012. This spread model is a derivative of the Northern American spread model Farsite, adapted for use in the Netherlands. In order to be able to make calculations with the model with the appropriate data, fuels research is necessary. The first fuels research was conducted on dry sandy grounds; heathland and forest, in 2012. It was followed by fuels research in dune area, peatland, and this year fuels research in forest areas. The analysed data will be validated before it is used in the spread model. So far a basic top10 Netherlands map has been used in the model. In order to be able to use all the fuel models that may apply to the Netherlands a more detailed fuels map is needed. A solution for this would be remote sensing. By using remote sensing images the model is able to calculate by up-to-date more detailed data then before. whereby an more accurate calculation can be made. This data can be used for predicting spread rates during a wildfire, and for management decision validation.

Dutch wildfire spreadmodel: Small scale fires, large scale impact

Oral Presentation

The last few years numerous wildfires caused evacuations and threatened civilian life and property. In 2012 the national government set up a program to prepare emergency responders and civilians for these wildfires. Since 2009 the Instituut Fysieke Veiligheid started on developing a spreadmodel for wildfires. Due to the smaller scale wildfires The Netherlands has compared to the US or Australia a spreadmodel would have to be more precise and work on a much smaller scale. Since 2013 this spreadmodel has been operational and is supporting regional emergency agencies on the suppression of wildfires. Since then the focus has changed from wildfire suppression to risk management.

Brown, Timothy

Dr. Brown conducts applied research and applications development including analysis of wildland fire-climate and fire-weather connections; the fire environment; applications development for wildland fire management planning, decision-making and policy; the interface between science and decision-making; and co-production of knowledge. Dr. Brown is Director of the Western Regional Climate Center and the Program for Climate, Ecosystem and Fire Applications (CEFA) at the Desert Research Institute in Reno, Nevada. He is graduate faculty in the Atmospheric Sciences Program at the University of Nevada, Reno, and a Monash University Adjunct in the School of Earth, Atmosphere and Environment, Science Faculty in Melbourne, Australia.

What is fire season and how long is it?

Oral Presentation

It is now frequently stated that the fire season is longer than it used to be, and for some places, like California, is year round. These statements are driven by local experience and numbers stated in some scientific literature. Single numbers (e.g., n number of days) are often cited as a definitive change in season length for the western U.S., for example. However, there is currently no scientific consensus on changes in the length of fire season, because given the complexity of the physical and human systems that fire encompasses, there can be numerous definitions of fire season and its length. In this presentation, three metrics of season length are compared. The first is based on documentary fire records, which include a number of event specific descriptions such as discovery and control dates. Another metric recently published in Nature Communications examined weather/climate from fire danger rating systems as an indicator of change. A third potential metric is large-fire season length as quantified using satellite derived estimates of fire radiative power to track burn days and growth rates. Comparison of even just these three methods highlights a need for further discussion on what defines wildland fire season length.

Brunner, Nicole

Nicole M Brunner is a graduate student and a physical science technician at the USGS. She is currently leading the validation work for the USGS Landsat Burned area science product.

Validation of the Landsat Burned Area ECV Product for the Conterminous U.S.

Oral Presentation

Complete and accurate burned area estimates are essential for characterizing fire occurrence patterns, fire impacts, and their potential changes. We assessed the accuracy of the U.S. Geological Survey Landsat-based Burned Area Essential Climate Variable (BAECV) product using 28 Landsat path/rows distributed across terrestrial biomes in the conterminous U.S. Reference data were generated by trained image analysts interpreting pre- and post-fire Landsat TM/ETM+ images. Three different analysts individually generated a burned area map for each path/row. There was variability in the extent of burned area mapped among the analysts therefore their results were combined to count the number of analysts that mapped a pixel as burned. This map was then used to assess the accuracy of the BAECV product at 3 confidence levels. Accuracy measures used in the assessment included: overall accuracy, dice coefficient, omission error, commission error, bias, and relative bias. Results of the accuracy assessment showed the range of omission error was between 47% and 67%, and commission error ranged between 31% and 62%. These results indicate that the BAECV product is more accurate than coarse-resolution remotely-sensed automated burned area products and is suitable for broad scale applications requiring spatially and temporally rich burned area data.

Buchanan, Beth

Beth Buchanan is a Regional Fire Ecologist for the US Forest Service. She works with forests across the 13-state Southern Region as well as with federal, state, NGO and university partners. She is co-lead of the Southern Blue Ridge Fire Learning Network, a successful four-state collaboration which works to reduce barriers to fire use. Additionally, she oversees the Region 8 fire effects monitoring program, and encourages managers to work together to compile data across unit boundaries in order to show successful adaptively-managed fire programs. She is a member of the Association for Fire Ecology, and three JFSP-funded knowledge exchange consortia.

Large-scale monitoring projects supplement fire effects research in the southern US

Oral Presentation

Fire ecology research in the southern United States has greatly benefitted land managers. Peer-reviewed publications document statistically-significant responses to prescribed fire treatments. However, research projects are limited spatially and temporally, hypotheses do not necessarily address local questions, and forest managers rarely have access to the original dataset. Managers complement research efforts with site-specific, long-term fire effects monitoring data collection as part of an adaptive management cycle. Managers use the data to inform burn prescriptions and environmental assessment documents. Changes in composition, structure and fuel loading associated with one or more treatments are used to measure progress toward desired conditions. If objectives are met, treatment is considered effective. If objectives are not met, managers may modify treatment parameters or revise objectives. Southern Region National Forests have been collecting monitoring data on fuels and vegetation in permanent plots since the mid-1990s. Units are encouraged to work across boundaries with neighboring districts and forests and other agencies that have similar management plans and monitoring types to combine and enlarge datasets. In general, this data tracks trends, which supplement the less-common, but more-rigorous, research studies. Fire effects monitoring offers multiple benefits to the forests as well as to national projects.

Fire Effects Monitoring Supports Expansion of Prescribed Fire Program in Kentucky

Poster Presentation

In the 1990s, a southern pine beetle (SPB) epidemic decimated the remaining suitable habitat for the last Kentucky population of endangered red-cockaded woodpeckers. As a result, key partnerships evolved and strengthened, culminating in USFS environmental assessment decisions to support prescribed fire on a landscape scale to restore fire-suppressed ecosystems. The formation of the Cumberland River Fire Learning Network galvanized collaboration of many diverse stakeholders and strengthened a vegetation monitoring program that tracks fire effects in permanent plots. Data from more than 90 plots has been entered into FFI (FEAT/FIRMON Integrated) where it is analyzed and utilized by forest personnel in an adaptive management strategy. Trend results indicate that on some ridgetops stands where the SPB had killed up to half of the overstory pine, multiple prescribed fires post-SPB have resulted in a new cohort of shortleaf pine and oak. To maintain the competiveness of the new cohort, without top-killing the seedlings, future burns need to be of low intensity. The adaptive management process is nimble enough to allow fire managers to prescribe fire when, where, and how it is needed, using variations in firing techniques, seasonality, and specific weather patterns to more readily obtain desired conditions.

Bucher, Margit

Margit oversees the fire management program on 50,000 acres of Conservancy lands in North Carolina. The program focuses on prescribed burning in longleaf, pocosin, oak and oak-pine forests. She has collaborated on research projects to identify ignition thresholds in organic soils, vegetative response to peat burns, and emissions from prescribed fire. She co-leads the Southern Blue Ridge Fire Learning Network, a partnership that collaborates to build resiliency in ecosystems and human communities in the southern Appalachian Mountains. She is a burn boss (RXB2), fire ecologist, and founding member and first Chair of the NC Prescribed Fire Council.

The Southern Blue Ridge Fire Learning Network: A collaborative partnership to restore fire-adapted ecosystems and sustain resilient natural and human communities in the southern Appalachian Mountains.

Poster Presentation

The Fire Learning Network (FLN, www.conservationgateway.org/fln) engages dozens of multi-stakeholder projects to accelerate the restoration of fire-adapted landscapes to sustain both natural and human communities. By restoring this balance, the ecological, economic and social values of the landscapes can be maintained and the consequences of catastrophic wildfire reduced. The Southern Blue Ridge FLN (SBR FLN) spans three million acres across the southern Appalachian Mountains in North Carolina, South Carolina, Georgia and Tennessee. State, federal, NGO and university partners in eight landscape teams collaboratively set goals, and share and apply the best available science and management practices to develop resilient ecosystems. The SBR FLN, now in its ninth year, continues to improve common vegetation maps, models and tools. This year saw landscape-scale growing season burns, multi-agency prescribed fires and a multi-day fire. Partners also actively engage in Joint Fire Science Programs consortia, whole system planning by The Nature Conservancy, a Collaborative Forest Landscape Restoration project, state prescribed burn councils, and the Fire Adapted Communities Network. With a history of well-attended workshops, numerous collaborative projects, and sharing knowledge through webinars and 23The Networker newsletter, the FLN has developed many strong working partnerships, which in turn get more fire on the ground.

Caggiano, Michael

Mike Caggiano is a Researcher and prescribed fire practitioner. He studies the physical pattern of development and wildfire related home loss in WUI communities and implements cooperative prescribed fire projects. He holds a Masters degree in Geography from the State University of New York, and is currently pursuing a PhD in Natural Resources at Colorado State University. He has experience implementing cooperative prescribed fire projects, has worked as a community forester implementing hazardous fuel mitigation, conducted firewise outreach, updated community wildfire protection plans, and is also a wildland firefighter.

Cooperative Prescribed Fire in New Mexico

Poster Presentation

In the early 2000's New Mexico experienced multiple escaped fires which has inhibited its ability to conduct prescribed fire. In the years since, it has primarily been the federal land management agencies that have continued to use prescribed fire. Despite the importance of leveraging local resources and value of building local capacity, often federal agencies do not coordinate prescribed burns with local communities. However, there are currently several cooperative prescribed fire efforts in New Mexico that are encouraging interagency coordinated prescribed fire that are increasing the number of treated acres in fire adapted ecosystems, providing training opportunities to local firefighters, building capacity in fire adapted communities, and improving wildland fire response. This presentation provides an overview of three different efforts that are promoting the use of cooperative Rx fire. It provides information on each, focusing on specific objectives, involved stakeholders, local context, implementation mechanisms, accomplishments, hurdles, and lessons learned. Understanding these efforts that are expanding the use of cooperative Rx fire in New Mexico may be beneficial for land managers and prescribed fire practitioners in other areas interested in working with communities to promote the use of Rx fire or improving interagency coordination associated with existing Rx fire efforts.

Creating High Resolution Maps of the Wildland-Urban Interface - Evaluating an Object Based Image Analysis Approach

Poster Presentation

Detailed maps of the WUI are useful tools for developing fire operations strategies, fuel hazard reduction planning, and wildfire community protection efforts. WUI maps could be improved through Object Based Image Analysis which has been widely applied to a variety of natural resource applications. In this study we evaluated the accuracy of an Object Based Image Analysis approach for mapping the WUI by comparing building locations points extracted from ten randomly selected National Aerial Image Program tiles across in the Colorado Front Range, to county building footprint control data. We also evaluated the accuracy of our method across various levels of precision, and for various physical characteristics of structures within the WUI. We found that our object based image analysis method could accurately identify 97% of the structures within the WUI using a precision of 100m. However, overall accuracy depended upon the size of structures and the desired precision. Our results suggest that the use object based image analysis provides an efficient and accurate method to map the WUI which could be used to extend current WUI mapping efforts and improve such applications as community wildfire planning and wildfire incident management.

Calkin, David

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

Structured risk assessment to achieve fire adapted communities

Oral Presentation

Numerous wildland urban interface (WUI) fires throughout the world have resulted in thousands of homes burned, significant ecological damage and numerous firefighter and civilian fatalities. Although the scale of losses is clearly on the rise, these fires are not without historical reference and share common characteristics. Wildfire is inevitable, but the destruction of homes, ecosystems, and lives is not. We examine how structure risk assessment may be applied to provide land management agencies, local governments, and affected communities the ability to reduce the potential for loss. Application of structured risk assessment allows the WUI wildfire problem to be broken down into component risk factors that help to identify the objectives, activities and responsibility for specific mitigation actions. In certain communities mitigating the likelihood and intensity of future wildfires will be highly cost effective, in others limited opportunities to modify landscape condition may require reducing the consequences once a fire occurs, and in some both strategies may result in significant benefit. A one size fits all approach to reducing wildfire risk does not exist. Structured risk assessment will be critical to develop a suite of cost effective actions to modify the trajectory of increasing loss.

Why we underinvest in fire on the landscape.

Oral Presentation

The ecosystem service values society derives from natural landscapes are influenced to varying degrees by wildfire. In those areas where ecosystems have evolved with frequent natural and human caused wildfire exclusion of wildfire may be socially desirable in the short-run to reduce potential damage or destruction of developed human infrastructure. However, in the long run efforts to remove wildfire from these landscapes become more challenging over time and suppression becomes counter-productive. Although the economic value of wildfire management has not been well established, research is coalescing around the realization that the existing wildfire suppression paradigm is likely inefficient and changes to management could result in improved socio-economic and ecological outcomes. We examine the current knowledge regarding landscape fuels management and conditions that may limit the amount of treatment activity compared to economically efficient levels including: 1) Negative budgetary feedback loops. 2) Competing environmental laws and managerial requirements. 3) Social acceptance of prescribed fire as a necessary component of treatment effectiveness 4) Failure to clearly articulate objective and associated risk factor addressed by activiites. 5) Emphasis on short term outcomes (managerial incentives, social expectations, decision biases). 6) Limited coordination between fuels and suppression.

Defining the right objectives at the right scale: keys to successful wildfire risk management

Oral Presentation

Risk management is one of the most discussed topics in wildfire management throughout the world. However, there remains considerable uncertainty around fundamental definitions and concepts of risk management, and how they can be implemented at varying levels of fire management organizations. A key feature of risk management is clearly establishing the context, which requires identifying decision makers and stakeholders, identifying the environment in which decisions are made, and defining clear, consistent, and measurable objectives. In this presentation we address opportunities for improved wildfire risk management, with a focus on establishing the context and recognizing the importance of defining the appropriate objective at the appropriate scale. A critical first step is to clearly understand that risk management is not an endpoint or an outcome to be reached, but rather a set of principles, frameworks, and processes that organizations can employ to effectively and efficiently achieve their objectives. Second, it is critical to recognize that risk management is not exclusive to any specific project or activity, but rather can be applied across all levels of organizations. When properly applied, risk management becomes an integral part of organizational processes and decision making, facilitates learning and continual improvement, and is responsive to change.

Campbell, Michael

Michael J. Campbell is a PhD student in the Department of Geography at the University of Utah. His research revolves around the use of GIS and remote sensing technology to study vegetation, fire and fire safety. Prior to his graduate work, Michael most recently worked as a Vegetation Mapping Specialist at the US Forest Service Remote Sensing Applications Center in Salt Lake City, UT.

Using Lidar to Determine Firefighter Safety Zone Size in Tahoe National Forest

Oral Presentation

The ability of wildland firefighters to efficiently determine the necessary size of safety zones is essential for preventing injuries and fatalities in wildfire events. Guidelines for safety zone size use a safe separation distance (SSD) from fuels that can be defined based on vegetation height, slope, and wind speed. The objective of this study is to employ the use of lidar data, which can approximate both terrain slope and vegetation height with high levels of precision and accuracy, to develop a GIS model for safety zone size assessment based on these guidelines. The model first identifies all of the gaps in the forested canopy of a minimum size, as defined by the number of personnel and engines present. It then delineates individual tree/shrub crowns of the surrounding vegetation and computes a mean height for each gap. Each gap is then assigned a score representing the suitability of that gap as a safety zone based on its size, geometry and surrounding vegetation height. The results will provide firefighters and managers with a valuable layer of safety information prior to engaging in firefighting operations. A lidar dataset from Tahoe National Forest in California was used to test the implementation of the model.

Carril, Dennis

Dennis Carril is the Fire Ecologist for the Santa Fe National Forest. Dennis has worked in wildland fire for 14 years and has a diverse background in varying fuel types and fire management strategies. During his wildland fire career, Dennis received his undergraduate degree in Forest Resource Management from Southern Illinois University at Carbondale (SIUC) in 2003. He later returned to pursue his masters' of science degree, also in Forest Resource Management, specializing in Fire Ecology where he graduated in 2009. Dennis has strived to bridge the gap between fire management and forest ecology.

Managing the Pino Fire for Resource Benefit.

Oral Presentation

Fire managers face infinite challenges in a dynamic political, ecological and operational environment. Santa Fe National Forest fire managers met these challenges head on when managing the 2014 Pino fire for resource benefit. The Pino Fire was started by lightning on August 13th, 2014 on the Jemez Ranger District of the Santa Fe National Forest and burned a total of 4,287 acres. Highly visible from Albuquerque and the state's capital of Santa Fe, the fire was managed in the rugged terrain of the southwest Jemez Mountains, a highly complex wildland urban interface (WIU). Consistent with historically frequent, low to moderate severity fires, the predominant vegetation type consists of ponderosa pine (75%) and white fir/Douglas fir (15-20%), with areas of pinon, juniper and oak. Fire severities for the Pino fire are as follows: 85.5% low, 10.5% moderate, and 4% high severity. The resulting fire effects created a patchwork mosaic across the landscape; areas of high and moderate severity are included within a large landscape of low severity. This unplanned ignition presented a unique opportunity to showcase, both internally and externally, a progressive fire management strategy that encourages ecological benefits and does not defer imminent wildfire risk to future generations.

Cassell, Brooke

Brooke Cassell is pursuing her PhD in the Dynamic Ecosystems and Landscapes Lab at Portland State University's School of the Environment. Her research focuses on landscape-level responses of forest composition and structure to strategic fuel treatments over time using the LANDIS-II model. She received her Masters in Forest Resources (Fire Ecology, 2012) from the University of Washington, College of Environmental and Forest Sciences. She has worked in various research assistant and field/lab technician positions and as a graduate student adviser with the McNair Achievement Program at UW.

Simulating long-term fuel treatment effectiveness under extreme fire weather across a mixed-conifer landscape in Eastern Oregon

Oral Presentation

Fuel treatments, such as thinning and prescribed burning, are widely recognized to be valuable tools in restoring resiliency of forested landscapes to wildfire. However, the efficacy of treatments depends on many factors including spatial placement on the landscape and how often treatments are repeated. Using a landscape-level forest succession model, LANDIS-II, this study-in-progress examines the effectiveness of fuel treatment placement, indicated by reduction of fire severity, across a mixed-conifer landscape under extreme fire-weather conditions with the goal of identifying "hot-spots" for treatment, as well as generalizable characteristics of those hot-spots. The study area is an approximately 600,000 ha landscape of dry ponderosa pine and moist mixed conifer forest in the southern portions of the Malheur and Wallowa-Whitman National Forests in Eastern Oregon. Effectiveness of treatments will be assessed based on wildfire risk on three simulated landscapes: 1. an untreated landscape; 2. an idealized landscape that is maintained by a natural fire regime; and 3. a treated landscape that prioritizes identified "hotspots" for restoration. Treated landscapes will be assessed both with and without the application of prescribed burning. Finally, wildfire risk and priority treatment areas will assessed in terms of their relationships with spatial, biotic, abiotic and socioeconomic determinants.

Castillo-Navarro, Maria

Maria Faviola is a professor at the University of Guadalajara; she has participated in fire ecology and natural resources management research projects in the Sierra de Manantlán Biosphere Reserve, characterizing fire regimes and vegetation ecology in Las Joyas Research Station. Since 2009 she has taught undergraduates courses such as Fire Management, Forest Ecology, Biological Conservation, Environmental Management and Ecological Land Use Planning. She is currently a PhD candidate at the University of Guadalajara, focusing in a classification of plant functional types based on response to fire.

Effects of fire on morpho-functional diversity of trees in subtropical montane forests of Western Mexico

Oral Presentation

Spatial and temporal variation of fire regimes across mountain forest landscapes plays a key role in the composition of plant communities. We selected 16 morpho-functional attributes related to the response of plants to fire events and their performance during fire intervals to classify 52 tree species, based on fire response functional types (FRFT), from temperate forests of Las Joyas Research Station in Jalisco, Mexico. We analyzed changes in the importance value index (IVI) of groups in a chrono-sequence of time since last fire. Multivariate classification and ordination of tree species differentiated three main FRFTs: A1, pines adapted to frequent low-severity surface fires, which dominates forests of the study area; A2, fire-tolerant oaks; and B, fire-sensitive hardwoods found on mesic sites (fire refugia) or colonizing pine-oak understory and forming mixed pine-hardwood stands as fire intervals lengthen. IVI of group B increased with time since last fire, while IVI of groups A1 and A2 decreased. We hypothesize that fire frequency and severity variation, fire suppression or prescribed fire interventions play a role in group formation. Changes of FRFT groups in plant communities should be considered in the design of fire management practices aimed at biodiversity conservation goals.

Catry, Filipe

Filipe Xavier Catry (FC) is a forest engineer and a post-doc researcher at Centre for Applied Ecology / Research Network in Biodiversity and Evolutionary Biology (CEABN-InBIO), Institute of Agronomy - University of Lisbon (ISA-UL) in Portugal. FC has MSc in Science and Geographic Information Systems and PhD in Forestry and Natural Resources. Since 1996 he has participated in more than 25 national and international R&D projects related to forest and fire ecology and management. FC has authored 24 papers in scientific international journals, 12 book chapters and more than 30 conference proceedings.

Modelling post-fire tree responses in western Mediterranean Basin forests

Oral Presentation

Wildfires are a recurrent disturbance in the western Mediterranean Basin, often causing quick and drastic changes in forest ecosystems. Despite the large economic and environmental impacts of forest fires, until recently there was very little published information about fire effects on tree species in this region. Research on this topic has increased substantially in the last decade, and several models relating post-fire tree responses with different factors, have been produced. These models play a very important role in predicting tree mortality and regeneration following fire, which may be crucial to assist pre- and post-fire management decisions. I will present an overview of several post-fire tree response models for conifers and broadleaves, which result from data collected in more than 30 burned sites and include thousands of trees belonging to 15 species, with particular emphasis on cork oak. I will point out and discuss the main results and the variables (fire and plant characteristics, as well as other ecological and management factors) that we have been using to predict post-fire tree responses.

Céspedes, Blanca

Blanca Céspedes has a PhD in Ecology by the University of Castilla La Mancha (uclm), Toledo, Spain. She is nowadays a post-doctoral scholar at the School of Forestry, Northern Arizona University (nau) in Flagstaff, Arizona, involved in a project based in modelling vegetation dynamics and fire regimen under climate change in the western part of Mediterranean. She is a fire ecology researcher and enjoys getting out in the field studying population and community dynamics in fire-prone ecosystems. Most of her work covers general topics as soil seed bank ecology, plant community dynamics in seeders-sprouters, disturbance ecology and global change biology.

Simulating fire and vegetation dynamics in mountainous Mediterranean forests

Poster Presentation

Mountain forests have been commonly affected by wildfires, hence their fire ecology has been widely studied and described. However, predictions of post-fire vegetation recovery under future climate change are still very uncertain, and more information is necessary for forest managers to make decisions about treatments. This paper focuses on modeling the natural vegetation dynamics in a mountain Mediterranean forest through different management actions, under current climate and climate change scenarios. We adapted and applied GREFOS, a forest gap dynamics model developed for the northeastern Mediterranean Basin, to the bioclimatic conditions of northwestern Mediterranean Basin by adjusting its fire and management modules. The model was parameterized with data on growth, structure and past fire events from a previous tree-ring study developed in a relict forest (Pinus nigra) in northeastern Spain. Moreover, a validation of the model was performed using data from the last national forest inventory and literature review for the dominant tree species in the study area. Results were interpreted in terms of regeneration dynamics and carbon storage of the vegetation under climate change and fire regimes. Implications of management actions could be critical for mountain Mediterranean forests facing changes in drought stress and fire frequency due to climate change.

Chambers, Marin

Marin Chambers is a masters student in the Graduate Degree Program of Ecology at Colorado State University, and is a graduate research assistant for the Rocky Mountain Research Station in Fort Collins, CO. Marin's research interests include disturbance ecology, specifically forest and fire ecology of the central Rocky Mountains.

Post-fire tree regeneration in severely burned ponderosa pine forests of the central Rockies

Oral Presentation

Wildfires have increased in size and severity in ponderosa pine - dominated forests in recent decades. The ability of ponderosa pine and other co-occurring conifers (e.g., Douglas-Fir, Rocky Mountain juniper, Colorado blue spruce) to regenerate in severely burned portions of such fires is unclear, as seeds must disperse from surviving trees. We quantified post-fire conifer regeneration in numerous 10+ year-old fires in Colorado, Wyoming, and South Dakota to examine whether severely burned patches are regenerating, and how regeneration is governed by abiotic and biotic factors. Our results from Colorado indicate that conifers have regenerated in severely burned areas, but at low densities (~100 stems ha-1). This contrasts with conifer regeneration in unburned and lightly to moderately burned areas, which was more than four times greater. Our Colorado results also illustrate that as distance from live trees increased, conifer regeneration decreased; transects averaged ~170 stems ha-1 25 m from the live forest edge and ~10 stems ha-1 250 m from the edge. Future analyses will incorporate data from Wyoming and South Dakota fires to examine whether these findings are applicable to the broader central Rockies region.

Chambers, Jeanne

Jeanne Chambers is a research ecologist with the US Forest Service, Rocky Mountain Research Station located in Reno, NV and an adjunct faculty member in the Natural Resources and Environmental Science Department at the University of Nevada, Reno. Jeanne has a BS in wildlife conservation, MS in rangeland science, and PhD in biology/ecology. Her research focuses on understanding the effects of global change processes, altered disturbance regimes, and invasive species on arid and semi-arid ecosystems and on developing effective conservation and restoration approaches.

A Holistic Management Approach for Addressing Invasive Annual Grass and Wildfire Threats to Sagebrush Ecosystems and Greater Sage-Grouse

Oral Presentation

Exotic annual grass invasions and altered fire regimes are threatening sustainability of sagebrush ecosystems in the western US, and managers and policy makers are seeking strategic, holistic approaches to fire and fuels management. Recent JFSP and NFP research indicates that an understanding of ecosystem resilience to disturbance and resistance to exotic annual grasses can be used to prioritize management activities across large landscapes and determine the most appropriate actions at site scales. An interagency WAFWA working group has linked this understanding with habitat requirements of greater sage-grouse, which is being considered for listing under ESA, and developed a habitat decision matrix for assisting land managers in best allocating resources. This approach was incorporated into the Subregional Greater Sage-grouse EISs and a BLM Fire and Invasives Assessment Tool used to prioritize sage-grouse habitat for targeted management activities. US Forest Service (FS) used a similar, threat-based processes. A series of Meetings, Factsheets, Field Guides, and Workshops has been developed through the Great Basin Fire Science Exchange and partners to step this approach down to the site. A 2015 Implementation Plan for DOI Secretarial Order 3336 – Rangeland Fire Prevention, Management and Restoration - provides necessary guidance to ensure application of this approach.

Cissel, John

John Cissel Program Director Joint Fire Science Program John has spent most of his career connecting science with land and resource management. Prior to his current position he worked as a Science Coordinator for the BLM-Oregon State Office, for Oregon State University as the Forest Director for the HJ Andrews Experimental

Forest, and for the Forest Service as the Science Coordinator for the HJ Andrews science-management partnership. Cissel, John H.; F.J Swanson; P.J. Weisberg. 1999. Landscape management using historical fire regimes: Blue River, Oregon. Ecological Applications 9(4): 1217-1231.

Best Practices for Improved Program Relevance and Outcomes

Oral Presentation

Fire science program funders want and need to know that the results of research are actually used to inform management and policy decisions. The Joint Fire Science Program (JFSP) has supported a number of studies to better understand and document how JFSP-funded research has influenced land, fire, and fuels management including: • An assessment of the use of science in federal agency fuels treatment environmental clearance documents • A detailed review of the outcomes resulting from a sample of JFSP-funded projects • An annual evaluation of progress made towards planned outcomes in the JFSP Fire Science Exchange Network JFSP has also funded work to better understand the influence of various factors on the adoption of fire science. The results of this work are synthesized in a set of fire science exchange best practices. These best practices have utility and find application throughout the science delivery and exchange community.

Cochrane, Jed

Jed Cochrane began his fire career at 19 as an initial attack crew member with the Province of British Columbia in the Rocky Mountains. In 2007, Jed completed an MSc in fire ecology at the University of British Columbia and joined Parks Canada as a national fire management officer. In 2013, Jed accepted a new position with Parks Canada as the Fire and Vegetation Specialist for the Lake Louise area. As the Fire/Veg Specialist Jed's time is spent overseeing operational response to wildfires, planning and implementing prescribed fires, mitigating/managing non-native plants and protecting/restoring rare and threatened ecosystems and native flora.

Managing Fire with Fire: creating fire resilient landscapes for now and into the future.

Oral Presentation

In Kootenay National Park, located in the Canadian Rocky Mountains, fire managers are applying a strategic combination of managed wildfires and prescribed fires to facilitate the return of fire to the ecosystem. These managed wildfires and prescribed fires occur at a larger scale, in conifer forests with a high or mixed-severity fire regime. Management targets for area burned and desired future forest conditions are developed using a suite of fire history research. Prescribed fire is applied strategically to contain future wildfires with the objective of achieving a resilient fire ecosystem. To support this, managers have zoned the park area and developed clear prescriptions to facilitate the return of wildfire to the ecosystem. These strategies have resulted in two recent, large wildfires achieving significant ecological gain at a reduced risk and cost. In addition, Parks Canada is part of an international collaborative re-burn project, investigating the impact of past fire suppression tactics on past wildfires to inform future decision making.

Cochrane, Mark

Dr. Mark Cochrane conducts interdisciplinary work combining ecology, remote sensing, and other fields of study to provide a landscape perspective of the dynamic processes involved in land-cover change. He is an expert on wildfire, documenting the characteristics, behavior and severe effects of fire in tropical and temperate forests that are inherent to current systems of human land-use and management. His research focuses on understanding spatial patterns, interactions and synergisms between the multiple physical and biological factors that affect ecosystems. Recently published work has emphasized the climate change, human dimensions of land-cover change and the potential for sustainable development.

Climate, Land Use and Land Cover Change-driven Fire Regime Shifts in Tropical Forests of the Brazilian Amazon and Indonesian Peatlands: Causes, Consequences and Divergences.

Oral Presentation

Through human agency, wildfires are growing in size and frequency across the tropics, shifting disturbance regimes across vast areas of tropical forest, with unanticipated consequences. Historically, high moisture contents and dense canopies made moist-tropical forests extremely resistant to fire spread. The frequency of intense drought is a prime determinant of both how often forest fires occur and how extensive they become but ignition sources are almost exclusively related to human activity. Forest fires in these regions are unintended ecological disturbances related to land use practices and land cover changes that can combine with climate changes to transcend deforestation and degrade forested lands, diminishing both ecosystem services and economic potential of these natural resources. Once-established, forest fires create positive feedbacks in future fire susceptibility, fuel loading and fire intensity until affected areas are effectively deforested. In forests on peatlands, removal of the trees is a precursor to establishing frequent ground fires that consume the organic soils, altering topography, hydrology, and future recovery potential. Unless current land-use and fire-use practices are changed, fire has the potential to transform large areas of tropical forest into scrub-savanna or flooded wetlands, seriously impacting biodiversity, human heath, and releasing globally-significant amounts of greenhouse gases.

Coen, Janice

Dr. Janice Coen is a Project Scientist at the National Center for Atmospheric Research in Boulder, Colorado. She received a B.S. in Engineering Physics from Grove City College and an M.S. and Ph.D. from the Department of Geophysical Sciences at the University of Chicago. She has served as a member of the Board of Directors of the International Association of Wildland Fire and is currently an Associate Editor for the International Journal of Wildland Fire. She investigates wildland fire behavior and its interaction with weather using coupled weather-wildland fire computer simulation models and by analyzing infrared imagery of wildfires and prescribed fires.

Coupled Weather-Fire Modeling of Landscape-scale Wildland Fires using Spatially Refined Satellite Remote Sensing Fire Detection Data

Oral Presentation

Coupled weather-wildland fire models tie numerical weather prediction models to wildland fire behavior modules to simulate the impact of a fire on the atmosphere and the feedback of these fire-induced winds on fire behavior. We apply the CAWFE coupled modeling system, combined with spatially refined (375 m) satellite active fire data derived from the Visible Infrared Imaging Radiometer Suite (VIIRS), which is used for initialization of a wildfire already in progress in the model and evaluation of its simulated progression at the next pass. Case studies of landscape-scale wildland fires illustrate our current capability to model the unfolding of large fire events. Over a wide range of conditions, simulations reproduce rate and direction of spread and expanding perimeter shape; events such as locations of sudden acceleration, flank runs up canyons, and bifurcations of a fire into two heads; and locations favorable to formation of phenomena such as fire whirls and horizontal roll vortices. Results show that a cycling forecasting approach, in which a sequence of CAWFE simulations initialize the fire 'in progress' with VIIRS data and updated atmospheric analyses, can overcome several forecasting issues and allow good representation of fire growth from first detection until extinction.

The King Megafire: Coupled weather-fire modeling enhanced by pre-HyspIRI imaging spectrometer and LiDAR fire and fuel products

Oral Presentation

The 2014 King Fire spread in an area with complex fuel beds shaped by drought, silviculture, and pre-existing burn scars. The CAWFE coupled weather-fire modeling system was used to simulate three fire periods including a surge up the Rubicon Valley. Control simulations prescribed spatial fuel model variability with LANDFIRE data and used National Infrared Operations and Visible and Infrared Imaging Radiometer Suite fire detection data to initialize and validate fire extent. Much of the King Fire burn area was surveyed shortly pre-burn and observed comprehensively by the pre-HyspIRI campaign during active burning, providing before, during and after coverage with high spatial and spectral resolution. From pre-fire data, Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) and LiDAR data were integrated to generate additional high resolution fuel model maps. Multi-band thermal infrared imaging (MASTER) provided high spatial resolution validation data revealing features along the fireline, fire phenomena, and areas of active fire spread. Results showed the King Fire's extreme behavior and unanticipated size resulted from complex mountain airflows beneath the resolution of forecast models and periods of growth apparently driven by fire-induced winds, both captured by CAWFE. They indicate remote sensing tools may be used to optimize data products for fire science and operations.

Cohen, Jack

Jack has been involved in wildland fire research since 1972 and has served at US Forest Service fire laboratories in Missoula, MT, Riverside, CA and Macon, GA (defunct). He co-developed the U.S. National Fire Danger Rating System, contributed to U.S. fire behavior prediction systems, conducted fire behavior research on southern California chaparral and defined the home ignition zone (HIZ) as the basis for home ignition potential from his wildland-urban interface (WUI) fire research. He has served operationally as a fire behavior analyst. Jack currently focuses his research on understanding the fundamental physics of wildland fire spread.

Fuel particle heat exchange during wildland fire spread

Oral Presentation

A wildland fire spreads when thermal energy from the flame zone heats nearby fuel particles leading to their ignition. This heat transfer can only involve convection and radiation heat transfer. Modelers have commonly assumed radiation to be the dominant heating mechanism; that is, radiation heat transfer primarily determines wildland fire spread. We tested this assumption using (a) experimental methods and (b) computational modeling to examine the contributions of radiation and convection related to fuel particle temperatures prior to ignition. One set of experiments controlled fuel particle exposures to a radiant panel and another set of experiments had particles exposed to flame fronts during spreading laboratory fires. The numerical model was not calibrated to match measured fuel particle temperatures because the purpose of the model was to represent the physical processes. Both experimental and numerical results from the controlled and fire spread experiments had conditions relevant to wildland fires and showed that convection (not radiation) was the dominant mechanism responsible for heating 1 mm particles to ignition. These results indicated that physical wildland fire spread models need to consider both convective and radiative heat transfer at fuel particle scales.

Collins, Luke

Dr Luke Collins is currently working as a Research Fellow at the Hawkesbury Institute for the Environment, University of Western Sydney on a project that examines the effect of elevated CO2 on understorey vegetation structure, fuel dynamics and ecosystem flammability. Dr Collins' previous research has largely focused on the effect of fire management on plants, animals, carbon sequestration and wildfire risk reduction.

Fire and tree mortality in resprouting eucalypt forests

Oral Presentation

Fire is the dominant agent of disturbance in Australian forests and woodlands and has been influential in shaping plant communities within these ecosystems. Approximately 80% of native Australian forest and woodland communities are dominated by trees from the genus Eucalyptus, Corymbia and Angophora (referred to as 'eucalypts'). Most eucalypt species regenerate vegetatively in response to fire via epicormic or lignotuber buds. Consequently, low levels of mortality have been recorded in forests irrespective of fire intensity (up to 5%), with mortality rates in savannah woodlands typically increasing with fire intensity. Few studies have quantified the long term effect of frequent burning on resprouting eucalypts, though the limited evidence suggests that frequent burning reduces stand biomass via increased tree mortality and reduced growth rates. Frequent burning increases mortality rates in smaller and larger trees within a population. Furthermore, frequent burning may accelerate collapse in larger trees via basal scaring (i.e. death of cambium). Drought is likely to increase rates of direct- and post-fire mortality in resprouting eucalypts, though studies quantifying this are lacking. The development of methodologies to quantify mortality of resprouting eucalypts over large spatial scales is necessary to better understand the effects of fire and drought.

Collins, Brandon

Brandon Collins is a Research Scientist with the US Forest Service and UC Berkeley. His research interests involve characterizing effects of fire and fuels treatments on forests. Much of Brandon's research is intended to be applied to inform forest management aimed at improving resiliency and incorporating more natural fire-vegetation dynamics across landscapes. His active research areas include: 1) stand development/recovery following fuel reduction treatments and wildfires, 2) modeled effects of landscape fuel treatment networks, 3) fire severity patterns and interactions among managed wildfires in long-term natural fire areas, and 4) characterizing variability in forests under more natural fire regimes.

What does moderate severity mean in pine-mixed-conifer forests and what is its fate when reburned by a large wildfire?

Oral Presentation

High severity fire in forests historically associated with low to moderate severity fire is receiving considerable attention in public forest management throughout the western U.S. While this level of attention is certainly justified given the impact on forest dynamics, high severity effects generally do not comprise a majority of the burned area. Previous work has suggested that moderate severity, which ranges from 20 to 90 % tree mortality, can result in live tree densities that were similar to historical forest conditions. One problem, however, is the additional surface fuels as fire-killed trees fall, which can exacerbate fire behavior in subsequent fires. We used an extensive field dataset sampled prior to and following a large wildfire in the Sierra Nevada to quantify structural change associated with "moderate" severity. We also examined the fate of areas previously burned at moderate severity when reburned in this same wildfire. Our results indicate that areas burned at moderate severity may be susceptible to high severity fire 10-20 years later if burned under wildfire conditions. This suggests that although moderate severity fire may be restorative for some structural attributes, follow-up treatments, such as prescribed fire, may be necessary to insure greater resilience to large wildfires.

Condon, Lea

Lea is a PhD Candidate at Oregon State University and has been a class instructor for the College of Forestry. Before coming to Oregon State, she worked throughout the west on projects related to plant recovery following fire as well as other disturbances such changes in flood regime. Lea's MS research separated significant effects of abiotic and biotic factors on the invasion of cheatgrass and the recovery of sagebrush following fire. This work was published in the International Journal of Wildland Fire.

An examination of the roles of grazing and fire on the ability of biological soil crusts to maintain site resistance to Bromus tectorum in the Great Basin

Oral Presentation

Recent work has shown that resistance to invasion by non-native annual graminoids, such as Bromus tectorum is maintained by perennial vegetation and biological soil crusts (BSCs) in the Great Basin. Using a mediation focused structural equation model, we examined the influences of fire and grazing on the ability of perennial vegetation and biological soil crusts to maintain site resistance throughout the region. Preliminary results show that increases in fire severity reduced resistance to B. tectorum, but increased the cover of perennial vegetation, which offset part of the loss of site resistance. Grazing by livestock had the single greatest effect on reducing site resistance. Fire exacerbated the negative effects of grazing on site resistance, as more severely burned sites experienced increased grazing pressure. A smaller but notable effect included increasing fire size, which decreased site resistance. Increased shrub cover was correlated with increases in lichens and mosses, perhaps due to their ability to protect BSCs from disturbance by grazing. Shrubs, lichens and perennial vegetation increased site resistance to B. tectorum and mosses facilitated the later two life forms.

Coop, Jonathan

Dr. Jonathan Coop is an Assistant Professor of Environment and Sustainability at Western State Colorado University. He was a field botanist, but then all the amazing places he knew and loved burned down. Then they burned again. This led to an interest in fire ecology, which led to a subsequent interest in fire and fuels management.

Mastication Treatments in Piñon-Juniper Woodlands: Fuels, Vegetation, and Bird Responses to a No-Analog Disturbance

Oral Presentation

Piñon pine-juniper woodlands represent one of the largest vegetation types in the continental US, and support a diverse, obligate avifauna. Management and restoration of piñon-juniper woodlands may be hindered by conflicting management aims and inadequate scientific understanding of management impacts. The purpose of our research is to examine the impacts of fuels treatments, particularly mastication, on fuels, vegetation, and bird communities across a 1- to 12-year-post-treatment chronosequence of treatments in central Colorado. During 2014 and 2015, we conducted bird point counts, characterized fuels, and measured vegetation composition and structure at 232 sites representing 29 treatment-control pairs. Mastication treatment effects on fuels—shifts from the woodland canopy to the ground—were pronounced and persistent, with increased 10- and 100-hour ground fuels evident even in the oldest treatments. Treatments exhibited large increases in cover by graminoids and forbs, particularly non-native and weedy annual plants. Not surprisingly, these changes were associated with shifts in bird species composition from piñon-juniper obligates towards species characteristic of open habitats. These findings have implications for fuels management and point towards directions for further work, for example identification of thresholds in residual tree density that may ameliorate negative ecological impacts while still accomplishing fire-hazard reduction objectives.

Coppoletta, Michelle

Michelle Coppoletta is an Ecologist for the Sierra Cascade Province of the USDA Forest Service, which includes the Lassen, Modoc, and Plumas National Forests. She received an undergraduate degree from UC Berkeley, and completed her graduate work in Ecology at UC Davis. She has worked as an ecologist and botanist with the Forest Service, National Park Service, and US Geologic Survey for over 15 years. When Michelle is not working as an Ecologist, she dedicates most of her time to her two young children and one very old dog.

Influence of post-fire vegetation and fuels on fire severity patterns in reburns: implications for restoration

Oral Presentation

In areas where fire regimes and forest structure have been dramatically altered, there is increasing concern that contemporary fires have the potential to set forests on a feedback trajectory with successive reburns, one in which extensive stand-replacing fire could promote more stand-replacing fire. Our study utilized an extensive set of field plots established following four fires that occurred between 2000 and 2010 in the northern Sierra Nevada and were subsequently reburned in 2012. The information obtained from these field plots allowed for a unique set of analyses investigating the effect of vegetation, fuels, topography, fire weather, and forest management on reburn severity. Our results suggest that high to moderate severity fire in the initial fires led to an increase in standing snags and shrub vegetation, which in combination with severe fire weather promoted high severity fire effects in the subsequent reburn. Our findings confirm that although fire behavior is largely driven by weather, components of post-fire vegetation composition and structure are also important drivers of reburn severity. In the face of changing climatic regimes and increases in extreme fire weather, these results may provide managers with options to create more fire resilient ecosystems in post-fire landscapes.

Corcoran, Bonni

Bonni Corcoran has spent her career working as a Biological Technician for the U.S. Forest Service at the Pacific Southwest Research Station in Riverside, California. She has worked in desert, chaparral, oak woodland, and conifer ecosystems throughout California, Arizona, New Mexico, Nevada, and Hawaii. She has focused extensively on chaparral vegetation response to wildfire and contributed to Burned Area Emergency Rehabilitation (BAER) effectiveness studies looking at plant and soil erosion responses to different post-fire mitigation treatments. Other work has included prescribed fire effects on surface and woody fuel consumption, soil and cambium temperatures, and nutrient cycling in ponderosa pine ecosystems.

Post-fire California chaparral soil seedbank diversity

Poster Presentation

Post-fire California chaparral soil seedbank diversity was compared in 2014 for two wildfires; 2006 Esperanza and 2013 Silver. Some Esperanza plots were re-burned in the Silver fire. Soil seedbank samples were collected at 25 locations at two depths (0-2 and 2-5 cm) to characterize plant community regeneration potential. Soil samples were spread on sterile potting medium in flats and germinated in an unheated greenhouse during winter through early summer, 2014. We identified 6,361 seedlings; 50% from Esperanza only. Re-burned plots had 27% fewer seedlings than Esperanza and Silver only. Average species diversity was greater for Silver only and re-burned compared to Esperanza only plots. Overall, we observed 83% native and 17% non-native species. Herbaceous species diversity was greater for Silver and re-burn (88) compared to Esperanza only (72) plots. Shrub and sub-shrub diversity was twice as great (14) in re-burn plots compared to Esperanza and Silver only (7). Grass diversity, mostly non-natives, was three times greater in Esperanza only plots. Re-burned seedbanks had lower grass densities and diversity. Re-burned soil seedbanks maintained viable shrub and sub-shrubs seeds. This soil seedbank greenhouse study showed that native species diversity persisted and invasive grasses were reduced when re-burned by close interval wildfire.

Cortés Montaño, Citlali

Citlali is a senior expert in biodiversity and forest management for the German Development Bank (KfW). She has more than 15 years of experience working in research and outreach in forest, biodiversity, and protected area management; fire ecology; and community silviculture in México. Biking, hiking (preferably to the top of mountains), and river trips are among her favorite things to do outside the office. Her work is inspired by Aldo Leopold's reflections on México's northwestern sierras, summarized in this 1937 quote: "I can only hope that Mexico will find ways so far unfound by us to use these mountains without destroying them."

1998: El Niño, wildfire, and the onset of a national fire management program in México

Oral Presentation

The year 1998 brought fundamental changes in the design and implementation of federal wildfire management policies in México, as one of the strongest El Niño episodes ever recorded set the stage for perhaps the worst fire season in tropical countries in the 20th century. A smoke plume from fires in central and southern México moved into Texas and as far as Minnesota, causing air quality problems and airport closures along its route. This led to a public outcry that pressured the US government to attempt to contain its growth. That emergency response resulted in a long-term cooperative fire management effort between the two countries, supported by the USAID mission and the USFS, and led by key players in Mexican government agencies, research bodies, and civil society organizations. Programs tackling immediate needs in logistics and planning in critical areas were developed, while mid- to long-term needs in research, fire management planning, and capacity building were also addressed. As these programs metamorphose and evolve with Mexico's fire and forest management framework, they have maintained the core values of the Mexico-US cooperation, which was based on addressing research needs, community involvement, and establishing links between forest conservation and fire management.

Coughlan, Michael

Michael Coughlan is an ecological anthropologist with research interests in historical ecology, human-fire-landscape dynamics, and co-evolution of land use practices, social institutions, and landscape. Michael specializes in socioecological methods that combine historical, archaeological, and natural archives through quantitative geospatial and chronological analysis. Michael is currently a post-doctoral research fellow at the University of Georgia where he is reconstructing anthropogenic fire regimes and land use history for the Calhoun Critical Zone Observatory, a natural laboratory focused on the roles human and natural forces play in shaping the Earth's critical zone.

Title: Transitioning from livelihood fire to fire suppression in the US Southeast: Causes and consequences of fire regime transition in two forested landscapes.

Oral Presentation

Human fire use and (mis)management has been a major forcing factor in numerous landscapes across the Earth, effecting vegetation cover, soils, and hydrological processes. We reconstruct and compare historical fire regime transitions in two geographically distinct landscapes in the Southeastern US for the period characterizing the transition from agricultural to forest-based land use (c.1935-1975). We use historical fire data from within and around what is now the Calhoun Critical Zone Observatory (South Carolina Piedmont) and Coweeta LTER Hydrological Laboratory (North Carolina Mountains). Historically, wildfire in the Southeastern US was largely driven by traditional livelihood (agrarian) fire use and management. During the transition period, Federal land managers saw livelihood fire use as wasteful and destructive. As a consequence, federal acquisition and management of land in the Southeast brought with it fire prevention policies and suppression management, radically altering this dimension of human-fire relations. Yet, at both sites, human-caused wildfires continue to dominate fire regimes with most fires caused by intentional ignitions. While these areas have similar histories of transition from a smallholder agrarian landscape to National Forest, we show how the environmental and socioeconomic settings differ in ways that help us better understand variability of human-fire-landscape dynamics.

Cram, Doug

Doug Cram is an Assistant Professor and Extension Fire Specialist in the Extension Animal Sciences and Natural Resources Department at New Mexico State University. His research and Extension efforts focus on management of forests, rangelands, and riparian areas with a particular concentration on the interaction of fire within these systems.

Using Broadcast Fire to Manage Mixed Conifer Forests

Poster Presentation

As a general rule of thumb, forest managers in the southwest have not used broadcast fire to manage mixed conifer forest stands. However, southwest tree-ring records and studies indicate that frequent fire characterized fire regimes in these forest types and shaped vegetation composition, stand development, and structure. Given the increased interest in using silvicultural techniques, including broadcast fire, to manage forest stands for resiliency to future disturbances such as insects, disease, and fire we partnered with the Lincoln National Forest to create replicated demonstration plots highlighting the full range of silvicultural treatments including broadcast fire. Our poster will present results from broadcast fires used on mixed conifer stands in the Lincoln National Forest, NM. Results will include data collected before and after prescribed fire on understory and overstory composition, structure, and fuel loading. Challenges to using broadcast fire in mixed conifer stands will also be discussed.

Creighton, Janean

Janean Creighton is an Associate Professor and Extension Specialist in the Human Dimensions of Natural Resources at Oregon State University, College of Forestry. Janean works on issues related to non-industrial private forests including intergenerational land transfer and climate change adaptation. She is also the Administrative Director for the Northwest Fire Science Consortium, which is part of a national Knowledge Exchange network funded by the Joint Fire Science Program. Janean received her M.S. in Wildlife Biology and her Ph.D. in Environmental and Natural Resource Sciences, both from Washington State University.

The known unknown: Bringing diverse stakeholders together to address a wicked problem

Oral Presentation

Many collaborative groups working across the eastside of Oregon and Washington have developed good working agreements on treatments appropriate for ponderosa pine forest types in fire-prone landscapes. Currently, there is less agreement on how to approach restoration and management of moist mixed-conifer forests, in large part because there does not appear to be a comparable scientific consensus as that which exists for ponderosa pine forest types. The Mixed-conifer summit brought together collaborative groups, agency staff, researchers and scientists to provide an opportunity for dialogue and interaction between communities, practitioners and scientists, and to share experiences from the field. A number of participating collaboratives took the information back to their communities and held local summits of their own on the same topic. This "value-added" component illustrates the power of providing a safe place for respectful discussion, the exchange of knowledge and expertise, and the sharing of important lessons learned around a wicked problem that ultimately may lead to solutions.

Cronan, Jim

Jim Cronan lives in Seattle, WA where he is a PhD Candidate at the University of Washington's School of Environmental and Forest Sciences and is also affiliated with the U.S. Forest Service, Pacific Wildland Fire Sciences Laboratory. He holds a BS from the University of Vermont and a MS from Yale University. His research interests include fuels and fire behavior, fire ecology, and restoration ecology.

Detailed fuelbed characterization and mapping for Eglin Air Force Base, FL

Poster Presentation

We present a detailed Fuels Characteristics Classification System fuelbed map and state and transition model for Eglin Air Force Base in northern Florida, USA to assist with fire planning efforts. Eglin encompasses 187,555 hectares and is the largest forested military reservation in the United States. Fire-dependent vegetation with a mean natural fire rotation of three years comprises 78% of Eglin's area. To maintain the fire regime, the natural resources management section for the base operates an ambitious prescribed fire program. Given the increase in military activities on the base and growth of residential areas surrounding the base, more accurate assessments of the impacts of prescribed fire may be required to justify and adequately plan burning operations. This fuelbed map categorizes fuel types by combining data from the Florida Cooperative Land Cover Map with other spatial data including mean fire rotation, stand age, dominant vegetation cover, soil type, and silvicultural history. Fuelbeds are temporally linked with a state and transition model providing the structure necessary to periodically update the map and conduct fire-succession modeling exercises. Both the map and state and transition model will help managers at Jackson Guard with future planning efforts.

Curtin, LIndsey

Lindsey Curtin is a fire ecologist on the George Washington and Jefferson National Forests (GWJ) in Roanoke, Virginia. She is co-leader of the Allegheny Highlands FLN Monitoring Working Group and is currently serving as secretary on the Virginia Prescribed Fire Council. Lindsey has spent much of the last three years working with partners to redesign the forest composition and structure monitoring data forms and protocol, in addition to establishing the use of FEAT and Firemon Integrated (FFI) for data storage and analysis. Currently, Lindsey is focusing on summarizing seven years of data collected on over 400 plots across the GWJ and Warm Springs Mountain Preserve.

Allegheny Highlands Fire Learning Network's Forest Composition and Structure Monitoring Program: A collaborative approach to evaluating long-term changes on prescribed burn units in Virginia

Poster Presentation

In 2009, collaborative forest composition and structure monitoring began on the George Washington and Jefferson National Forests (GWJ) and The Nature Conservancy's Warm Springs Mountain Preserve (WS Preserve). The monitoring program focuses on collecting long-term canopy cover, overstory, mid-story, and understory data on one-hundredth acre circular plots. Forest Service and TNC partners have installed over 400 plots on burn units in dry, dry-mesic, and mesic vegetation types. Field data is entered into FEAT and Firemon Integrated (FFI) for storage and analysis. Initial data summarization compares one-year post-burn to baseline data, and investigates changes occurring after two or more burns. Four common burn objectives are currently evaluated using plot data: opening the canopy to allow more light to the forest floor, decreasing shade tolerant seedlings and saplings, increasing oak (Quercus) and pine (Pinus) seedlings and saplings, and increasing diversity in the understory. Results from data inquiry are an essential step of the adaptive management process, informing and influencing future management decisions across the forests and preserve. Fire management officers benefit by evaluating burn frequencies and firing techniques, in addition to tracking progress towards achieving collaboratively developed management objectives and desired conditions for the project area.

Davies, Kirk

Dr. Kirk W. Davies is a Rangeland Scientist with the Agricultural Research Service located in Burns, OR. He conducts research on disturbance ecology, invasive species management and ecology, restoration ecology, and semi-arid plant community dynamics. He has published over 65 peer-reviewed journal articles and more than 50 book chapters, extension articles, and proceeding papers.

Livestock Grazing Influences Wildfire Risk and Effects in Dry Sagebrush Communities

Oral Presentation

Wildfire in dry sagebrush communities elevates the risk of exotic annual grass invasion, causes a short-term loss of forage, and decreases sage-grouse and other sagebrush-associated species habitat for decades. Treatments are needed to reduced wildfire risk and increase resilience to fire and resistance to post-fire exotic annual grass invasion. Grazing is probably the only logistically feasible treatment because of the expanse of these rangelands. We evaluated the effects of moderate grazing by cattle during the growing season on fuel characteristics and post-fire recovery. We also investigated the effects of winter grazing by cattle on fuel characteristics and fire behavior. Grazing can reduce wildfire risk and severity in dry sagebrush communities. Grazing decreased fine fuel height, accumulation and continuity without affecting shrubs. Winter grazed areas were unlikely to burn until late August because grazing increased fine fuel moisture content. In contrast, ungrazed areas were dry enough to burn in late June to early July. Flame heights, area burned, and rate of spread were reduce by more than 50% in grazed compared to ungrazed areas. Moderate grazing also increased the resilience of native herbaceous vegetation to fire and decreased post-fire exotic annual grass invasion and dominance for decades.

Davis, Brett

Brett Davis is an Ecologist and Fire Modeler at the Fire Sciences Lab in Missoula, MT. Before joining the Fire Sciences Lab, Brett worked for eight years at the Aldo Leopold Wilderness Research Institute in Missoula as a GIS Specialist and Fire Modeler. His work at the Leopold Institute focused on wildland fire behavior and ecological impacts with a focus on the restoration of fire as a critical ecological process. He holds a B.A. from the University of Colorado, Boulder in Environmental, Population and Organismic Biology and an M.S. in Forestry from Colorado State University, Fort Collins.

Predicting Fire Severity: Informing Fire Management Decision-Making

Poster Presentation

Identifying where on the landscape wildland fires have the potential to burn with high severity can be essential to fire planning and mitigation efforts. The Fire Severity Mapping System Project (FIRESEV) is an effort to provide critical information and tools to fire managers that will enhance their ability to assess potential ecological effects of wildland fire. A major component of the FIRESEV project is the development of the Severe Fire Potential (SFP) map, a geographic dataset covering the conterminous United States that depicts the potential for wildland fires to burn with high severity where and when they do occur. Coupled with information on current landscape conditions, FIRESEV SFP data can help differentiate areas where fire may help restore fire-adapted ecosystems and where it might have less favorable impacts. These data are intended to be incorporated into existing decision support frameworks such as the Wildland Fire Decision Support System (WFDSS). The SFP dataset is complete and available online for the western US. We are on pace to complete the eastern US by early autumn 2016. Through this project we are greatly enhancing our understanding of environmental influences on burn severity and providing a new resource to support fire management decisions.

Dell, Jane

Jane Dell is pursuing a doctoral degree in Ecology, Evolution, and Conservation Biology at the University of Nevada, Reno. Her research focuses on the intersection of fire and plant/insect diversity in longleaf pine forests.

Quantifying the effects of burning on the diversity of arthropods in a fire-adapted longleaf pine (Pinus palustris) forest

Student Poster Presentation

Fire alters the structure and composition of the vegetative community and affects overall ecosystem function. As arthropods are tightly associated with vegetative habitat, understanding the response of the insect community to burning in fire-adapted landscapes such as the longleaf pine (Pinus palustris) forest is important for evaluating the resilience of the ecosystem to such disturbances. To quantify the arthropod response, we erected a series of malaise traps to sample before, during, and four periods post-fire for one year at Eglin Air Force Base in northwestern Florida. Specimens were organized by morphospecies, identified to family, and assigned to a trophic guild. Abundance and richness of morphospecies were used to calculate diversity indices for community composition and fire stage comparisons. As the greatest increase in taxonomic diversity was seen in three highly vagile orders, dispersal ability may give greater resilience to mobile taxa and provide increased recolonization potential as the vegetative habitat returns post fire. Trophic diversity response indicates that bottom-up regulation is resulting in decreased predator diversity and latent recoveries in parasitoids and detritivores. Quantifying the diversity of the arthropod community allows for comparisons in the responses of numerous taxa enhancing the understanding of ecosystem response to disturbance.

DellaSala, Dominick

Dr. Dominick DellaSala, Chief Scientist Geos Institute, is an internationally renowned author of over 200 papers on forest and fire ecology, conservation biology, endangered species management, and landscape ecology. His 2011 book "Temperate and Boreal Rainforests of the World: Ecology and Conservation" received an academic excellence award from Choice magazine, one of the nation's premier book review journals. His new book is co-edited with Dr. Chad Hanson "The Ecological Importance of Mixed-Severity Fires: Nature's Phoenix," Elsevier.

Ecological importance of mixed-severity fires: nature's phoenix

Oral Presentation

Mixed- and high-severity fires with their pulse of post-fire biological activity, produce exceptional levels of biological diversity comparable to the more heralded old-growth forests. Such fires are prevalent in many regions of the world, acting as restorative agents rather than catastrophes as often claimed. We present the first global synthesis of the ecological importance of these fires, mostly in montane forests of western North America but with global examples, discuss where deficits (e.g., western North America forests) or excessive occurrences may exist (e.g., western North America chaparral), how size and intensity of fires might change with climate change, and recommend ecological approaches for coexisting with fire. New policies and an ecological lexicon are needed to inspire awareness of the unique floral and faunal phoenix in fire-dependent montane forests and shrublands.

DeMeo, Thomas

Tom DeMeo, Ecologist, Pacific Northwest Region, USDA Forest Service Tom has extensive experience with landscape assessment and its application, and is fortunate to work with the Regional ecology program, a network of applied scientists serving the National Forests and people of the Pacific Northwest. He is also fortunate to work with great partners, such as The Nature Conservancy, LANDFIRE, Oregon State University, the Pacific Northwest Research Station, and the Fire Science Consortium.

A new approach to evaluate forest structure restoration needs across Oregon and Washington, USA

Oral Presentation

Widespread habitat degradation and uncharacteristic fire, insect, and disease outbreaks in forests across the western United States have led to calls to increase the pace and scale of forest restoration. In this study we demonstrate a new approach for evaluating where, how much, and what types of restoration are needed to move present day landscapes towards a Natural Range of Variability (NRV) across eastern Washington, eastern Oregon, and southwestern Oregon. Washington-Oregon specific datasets are used to assess needed changes in current forest structure by disturbance and/or succession at watershed and regional scales. We identified needed changes in structure on 4.7 million+ ha (40% of all coniferous forests) in order to approximate NRV structure at the landscape scale. Both the overall level and the type of restoration need varied greatly between forested biophysical settings. Regional restoration needs were dominated by the estimated 3.8+ million ha in need of thinning and/or low severity fire in forests historically maintained by frequent low or mixed severity fire (historical Fire Regime Group I and III). However, disturbance alone cannot restore NRV forest structure. On an estimated 2.3 million ha we identified disturbance followed by succession was required to restore NRV forest structure.

Derr, Kelly

Kelly M. Derr is a Project Archaeologist with Historical Research Associates, Inc. She has worked as a professional archaeologist for the past 14 years and specializes in paleoecology. Dr. Derr's research focuses primarily on precontact hunter-gatherers of the Pacific Northwest including the identification of anthropogenic fire in archaeological and paleoecological records. Theoretically, Dr. Derr is most interested in understanding how burning practices contributed to resource intensification by the Coast Salish people of southwestern British Columbia, and how such practices shape social complexity and ecosystem resilience in small-scale societies worldwide.

Humanized Landscapes: How Fire Shaped Small-Scale Societies in the Pacific Northwest

Oral Presentation

Ethnographic data and historical accounts depict the use of understory fire as a tool to manage plant and animal communities by most Native American groups in western North America. Paleoecological data suggest that anthropogenic fire was used for millennia and that some key plant communities were created through deliberate manipulation of the landscape by small-scale societies in the Pacific Northwest. As a result, modern vegetation communities need to be considered a product of both anthropogenic burning and lightning fires. This paper presents the current understanding of anthropogenic fire in the Pacific Northwest and explores the role fire played in shaping not only landscapes, but also the social fabric of small-scale societies. Using the Coast Salish of the Southwestern British Columbia as an example, I suggest that fire was a critical component of plant resource intensification and discuss how anthropogenic burning contributed to the emergence of social complexity in hunter-gatherer societies. These practices not only shaped humanized landscapes and but also served as a mechanism for ecosystem and social resilience in the precontact Pacific Northwest.

Dey, Daniel

Dan Dey is Research Forester and Project Leader of the Ecology and Sustainable Management of Central Hardwood Landscapes research unit in Columbia, MO. Dan's professional forestry career began in 1979 as a forester on the Tongass National Forest in Alaska. Since 1987 he has been conducting silviculture research in eastern hardwoods in eastern North America.

THE SILVICULTURE OF OAK WOODLAND AND SAVANNA RESTORATION

Oral Presentation

Oak woodlands and savannas are characterized by open structure and diverse ground flora. They were common in the prairie-forest transition zone where low intensity fires occurred frequently. In the absence of fire, many of these natural communities have succeeded to compositions and structures resembling mesophytic forests. Consequently, there is increasing interest by forest managers to restore the structure and composition of oak woodlands and savannas by thinning and applying prescribed fires. Despite the increasing interest, there are few guidelines based on silvicultural principles for restoring and managing woodland and savanna ecosystems. Lacking are (1) structural and stand density targets based upon historic reference conditions, (2) thresholds for quantifying canopy openness or closure linked to stocking equations and measures of available sunlight, and (3) guidelines for maintaining fire-free periods for ensuring regeneration and recruitment for sustaining trees in woodland ecosystems and for producing merchantable timber. Many silvicultural concepts, principles, and methods for managing forests can also be used for managing woodlands and savannas. However, the application and timing of treatments may differ to meet the objectives of woodland and savanna management. We offer guidelines for restoring and managing these natural communities based on research findings and long-standing silvicultural principles.

Dickinson, Matthew

Mark A. Dietenberger, Ph.D., is a senior research general engineer focusing on fire safety research within the Building and Fire Sciences research work unit at the US Forest Service, Forest Products Laboratory. Wood industry officials consider Dr. Dietenberger as their expert in test methods and modeling for the rate of heat, mass, and smoke releases.

Flammability Characteristics of Common Garden Litter under FPL Instrumented Hoods

Oral Presentation

Matthew B Dickinson is a Research Ecologist at the USFS Northern Research Station in Delaware, Ohio. He and colleagues work on the more direct effects of fires and their linkages with fuels and fire behavior. Papers in an upcoming issue of the International Journal of Wildland fire on the RxCADRE project illustrate the field measurements side of the work.

Dickinson, Matthew

Matthew B Dickinson is a Research Ecologist at the USFS Northern Research Station in Delaware, Ohio. He and colleagues work on the more direct effects of fires and their linkages with fuels and fire behavior. Papers in an upcoming issue of the International Journal of Wildland fire on the RxCADRE project illustrate the field measurements side of the work.

The missing link between fire behavior and tree injury and mortality in wildland fires

Oral Presentation

Good work has been done on predicting wildland fire behavior and, separately, on how tree boles are affected by heating and how crowns are affected by the hot and dry atmosphere of the plume. We are concerned with characterizing the link between fire and its effects, a link to be found in the physics of energy transfer. A holistic view of a tree's response to a fire is required to know what features of a fire are important. When a fire burns below a tree crown with actively transpiring foliage, stomatal control is slow enough that water loss drives flow in the branches, but elevated vapor pressure deficits in the plume "scorch" foliage, and may cause cavitation in branches. A tree's bole may be heated by both thermal radiation and convective heat transfer from wildland fire. The distribution of heat around, through and upward along the bole is significantly affected by the interaction between the cylindrical bole and the flame. We bring various measurements and models to bear on the problem of linking fire and plume behavior with corresponding effects on tree boles and crowns, and consider the requirements of future fire effects prediction systems.

Consequences of the "mesophication" of mixed-oak forests in the Appalachian Plateau of Ohio - effects of litter source and topography on fuels and combustion

Poster Presentation

In mixed-oak forest in the eastern US, oaks are often being replaced by more mesophytic species, prominent among them being red maple (Acer rubrum). Fire suppression is prominent in this forest compositional shift and changes in fuels are expected to complicate the use of fire in oak ecosystem restoration. We implemented a common garden experiment involving replicated plots of litter from oak- and maple-dominated stands. The caged plots were distributed among topographic positions over an Ohio Hills landscape. Litter was collected after leaf fall and equal dry masses of litter of each type were spread evenly over each plot thereafter for four years. Litter mass and bulk density were strongly affected by litter source, with oak litter showing higher loading and less compact beds than maple litter. Topographic effects on litter mass and bulk density were less pronounced while fuel drying rates were primarily determined by topography. Samples of intact litter and underlying soil from xeric and mesic plots were tested in a Cone Calorimeter (ASTM E1354-11a). Flammability of the samples reflected the compactness of litter beds and species differences in thermochemistry. Overall, our results predict negative feedbacks on fire from forest compositional shifts that are mediated by topography.

Dicus, Christopher

Dr. Chris Dicus is a Professor of Wildland Fire & Fuels Management at California Polytechnic State University, San Luis Obispo. He serves on the Board of Directors for the Association for Fire Ecology and is Coordinator of the WUI Module of the California Fire Science Consortium. He enjoys traveling the world to meet with colleagues and subsequently set their country on fire (legally).

Changing WUI Fire Risk in Dissimilar Communities of Southern California, USA

Oral Presentation

Even with increasing governmental budgets allocated to suppression resources, wildfires annually destroy great numbers of homes and critical infrastructure in the wildland-urban interface (WUI). To aid policy development, we evaluate changes to risk through time in dissimilar communities that are expanding into fire-prone areas, which conventional wisdom states would contribute to escalating losses. However, various mitigation strategies such as defensible space and improved construction standards have recently been mandated for new developments in California. Subsequently, older high-risk communities may actually become buffered from wildfires as the WUI expands and lessens their exposure to flames and embers. Thus, expanding WUI may either increase or decrease risk of loss dependent upon the extent of altered fire exposure and the application of mandated mitigation strategies. To help elucidate this seeming dichotomy, we utilize multiple GIS strategies to spatially analyze changes to risk based on characteristics of community wildfire exposure and characteristics of individual structures, including roofing materials, defensible space, and housing density. Our research simultaneously (1) quantifies expansion of the WUI over time in multiple, dissimilar communities, (2) analyzes temporal changes to risk based on altered wildfire exposure and structural characteristics, and (3) compares potential social factors influencing compliance of state fire regulations.

Dillon, Gregory

Greg Dillon is a Spatial Fire Analyst with the Fire Modeling Institute, part of the USDA Forest Service's Fire Sciences Lab in Missoula, Montana. His work generally involves geospatial and statistical analyses of large spatial datasets related to fire and fuels management on public lands. Among other things he is currently involved in spatial wildfire risk assessments at national and local scales. Greg's previous work includes potential vegetation mapping for the LANDFIRE project and analysis of satellite-derived burn severity data. He has a BS in Geography from James Madison University and an MA in Geography from The University of Wyoming.

Using probabilistic model outputs to address wildfire management questions at a range of spatial scales

Oral Presentation

How should land management agencies allocate funds and strategize about fire and fuel management priorities at national and regional scales? How can land managers at finer scales develop thoughtful and defensible spatial fire response plans that incorporate the best available science and integrate with other resource management objectives? How can the potential social consequences and ecological effects of fire be considered in management decisions during a wildfire incident? The answer to these questions lies, in part, in looking at probabilistic outputs from wildfire simulations and statistical modeling. Advances in stochastic wildfire simulation, particularly using the FSim modeling system, have provided spatial information needed to quantify the likelihood and potential intensity of future wildfires and evaluate the relative consequences of fires starting in different locations. This information can be applied to evaluate many fire and fuels management questions. In addition, statistical models that associate high-severity fire effects from past fires to site characteristics can also provide useful information to incident managers about where ecological fire effects may be more or less severe. Here, we present several examples of how probabilistic model outputs can and are being used to address uncertainty in wildfire management and answer questions at a variety of scales.

Douglas, Thomas

Dr. Douglas is a Senior Scientist with the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) in Fairbanks, Alaska. He works within the fields of geochemistry, hydrogeology, and environmental characterization. He uses biogeochemical tracers, field measurements, and geospatial tools to investigate environmental processes at a range of environmental temperatures and spatial scales. Current projects include: 1) using biogeochemical and geophysical measurements to investigate permafrost geomorphology and hydrogeology; 2) hydrogeologic investigations of glacial and permafrost terrains; and 3) linking snow and sea ice chemistry with atmospheric contaminants with a focus on the high Arctic.

Relationships between fire and permafrost in boreal and subarctic landscapes

Oral Presentation

In the northern boreal biome, vegetation protects permafrost from summer thawing but the moss, peat, and understory vegetation are susceptible to combustion, particularly during high severity fires. Permafrost-vegetation-fuel interactions are also critical for understanding how wildfire affects high latitude carbon cycling. This presentation will provide an overview of feedbacks between permafrost characteristics, geomorphology, vegetation, and peat thickness in Interior Alaska forests. Permafrost stability is critical in governing post-fire vegetation transitions in these forests since replacement of conifers by deciduous trees is unlikely to occur in ecosystems with stable permafrost and thick organic soils. In boreal peatlands the degradation of ice-rich permafrost may have particularly strong impacts on fire risk due to potential thaw settlement and water impoundment. We will demonstrate these relationships by showing effects of fire disturbance on permafrost in the Tanana Flats lowlands of Interior Alaska. Thaw settlement following wildfire and the loss of upper ice-rich permafrost averaged 0.3 m within three years. Subsidence and water impoundment resulted in forest-to-wetland conversion and the replacement of flammable vegetation (black spruce/feather moss communities) with much less flammable fuels (sedges and semi-aquatic Sphagnum). By regulating vegetation transitions, permafrost may have strong influences on fire regimes across multiple fire cycle periods.

Dunn, Christopher

Christopher Dunn is a Faculty 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 by investigating large wildfire management effectiveness and efficiencies with the Rocky Mountain Research Station in Missoula, Montana.

How do we develop optimal incident management strategies for a new large-fire management paradigm?

Oral Presentation

Wildfire extent and intensity have increased in recent decades as the legacy of historical management interacts with a rapidly changing climate. These trends stimulated management focused on fuels reduction and forest restoration. However, landscapes are not being treated broadly enough to influence them, and costs incurred by highly-valued resources and assets and agency budgets continue to increase. Researchers and managers alike are turning towards large-fire management to expand the 42right kind of fire in the right place as a pathway to achieve ecological and economic objectives. This requires a shift in land, resource and fire management objectives and adaption of this complex system to a new fire management paradigm. We present challenges and opportunities for achieving this transition, including pre-suppression planning and large-fire incident management. We then propose a new dynamic, multi-response model of large fire management that considers uncertainty in land management objectives, environmental conditions and suppression resource availability, efficiency and effectiveness. This model identifies optimal management strategies that reduce impacts to HVRAs while limiting firefighter exposure to hazards, but requires improved data and modeling capacity. Integration of expert knowledge with this analytical approach will also help fire management organizations more effectively adapt to the new fire management paradigm.

Improving fire severity maps to assess forest resilience: Tree survival is more important than mortality for vegetation response to mixed-severity fire

Oral Presentation

Increasing wildfire extent and intensity in recent decades has raised concerns regarding the resilience of ecosystems to a rapidly changing climate. A common method for quantifying landscape fire effects uses the differenced Normalized Burn Ratio (dNBR), or its relativized version (RdNBR), to estimate percent overstory mortality. The landscape configuration of fire severity is often correlated with ecosystem resilience, yet vegetation response across the fire severity gradient remains uncertain. We assessed Douglas-fir forest's resilience to mixed-severity fire from 168 – 0.10ha nested plots spanning an unburned to high-severity fire gradient. We correlated post-fire forest structure with understory vegetation and tree regeneration to characterize this critical aspect of ecosystem resilience. Surviving tree basal area was the most important factor influencing post-fire vegetation response, not percent mortality, suggesting fire severity maps do not capture the most important information for predicting ecosystem resilience. We further describe this disparity and offer a different look at post-fire conditions by combining pre-fire forest structure with fire severity maps for ten fires in our study area. We conclude that context matters, especially in forests manipulated by previous management activities, and that more field sampling and better spatial data sets are needed to assess ecosystem resilience to contemporary wildfires.

How do we develop optimal incident management strategies for a new large-fire management paradigm?

Poster Presentation

Wildfire extent and intensity have increased in recent decades as the legacy of historical management interacts with a rapidly changing climate. These trends stimulated management focused on fuels reduction and forest restoration. However, landscapes are not being treated broadly enough to influence them, and costs incurred by highly-valued resources and assets and agency budgets continue to increase. Researchers and managers alike are turning towards large-fire management to expand the 43right kind of fire in the right place as a pathway to achieve ecological and economic objectives. This requires a shift in land, resource and fire management objectives and adaption of this complex system to a new fire management paradigm. We present challenges and opportunities for achieving this transition, including pre-suppression planning and large-fire incident management. We then propose a new dynamic, multi-response model of large fire management that considers uncertainty in land management objectives, environmental conditions and suppression resource availability, efficiency and effectiveness. This model identifies optimal management strategies that reduce impacts to HVRAs while limiting firefighter exposure to hazards, but requires improved data and modeling capacity. Integration of expert knowledge with this analytical approach will also help fire management organizations more effectively adapt to the new fire management paradigm.

Duran, Elyssa

Elyssa is a Master's student at NMHU in Las Vegas, NM. In addition to researching prescribed fire, Elyssa researched soil effects of the 2011 Las Conchas fire, Jemez Mountains, New Mexico. Her primary interest lies in applying prescribed fire to the landscape as a management tool. Elyssa is also a Forester with BLM in Taos, NM where restoration efforts are being implemented.

Understanding Effects Of Heat Dosage On Soils From Slash Pile Burning In A Pinon-Juniper System (Pinus edulis-Juniperous monsperma)

Oral Presentation

Historically the Pinon-Juniper (Pinus edulis-Juniperus monosperma) savannas of the Lincoln National Forest near Ruidoso, New Mexico were less dense, with large open patches of grasslands with interspersed shrubs. Encroachment of these species is not well understood. One method used to restore Pinon-Juniper savannas is thinning the trees, and creating slash piles that are later burned. The goal of this study is two-fold: 1) to evaluate the heat dosage (intensity and duration) during burning across a spatial gradient 2) to relate heat dosage in the slash piles to post-fire effects on the soil. Ten large slash piles were selected with control sites of a similar size immediately adjacent. Fuel loads were calculated and thermocouples were placed at set points across the spatial gradient. We examined soil moisture, soil infiltration, soil pH, soil carbon content, soil texture, and soil stability within treated and control piles. These measurements along with the thermocouple data will help us understand fire effects on soils. Preliminary results suggest that there is a heat dosage gradient from the center of the pile to the edge, and that the fire effects on soils are correlated to the heat dosage. These findings will help inform resource decisions for land managers.

Dyer, Jennifer

Jennifer Dyer is the Heritage Program Manager for Six Rivers National Forest in Northern California. Prior to coming to Six Rivers NF, she was the Staff Archaeologist for the Jemez and Cuba Ranger Districts on the Santa Fe National Forest in New Mexico. She has worked on some large collaboratively-developed landscape restoration projects, including the Western Klamath Restoration Partnership and the Southwest Jemez Collaborative Forest Landscape Restoration Project. For both projects, restoring fire at the landscape scale to protect cultural resources is an overarching objective.

Restoring Fire at the Landscape Scale to Protect Sacred Sites

Oral Presentation

In general, restoring fire is beneficial to cultural resources and is essential to the health of our forests. However, high severity fire can adversely affect the integrity of cultural resources and sacred sites. By better understanding the thresholds for when fire becomes a significant threat to cultural resources (i.e. temperatures, duration), we can develop management objectives for the reintroduction of fire at the landscape scale. Archaeologists primarily focus on objects and material remains of the past. We are trained to identify and record places or sites with clearly delineated boundaries based on the location of artifact concentrations and features. However, artifacts and features are only one piece of the puzzle to understanding the past and contemporary uses of cultural landscapes. We need to expand our definition of cultural resources. Some of the most important places may have no material remains, such as food gathering areas, hunting grounds, springs, ridges, trails, and peaks. Working closely with Tribes, archaeologists can start to better understand the broader context and significance of cultural resources and sacred sites. Tribal input is essential for identifying culturally important areas and sacred sites, as well as for receiving input regarding management objectives and actions for these sensitive areas.

Edwards, Gloria

Gloria J. Edwards, Program Coordinator, Southern Rockies Fire Science Network.brings a multi-disciplinary background in natural resources, including archaeology, forestry, wildfire, and education to the Southern Rockies Fire Science Network. She is a graduate of University of Maryland and Northern Arizona University, and has worked with five national forests, firefighting, and private forestry contracting. Having experiences both research as well as on-the ground work in forestry and wildfire, she finds the challenge of science delivery and knowledge exchange to be forever creative and rewarding.

Adapting fire knowledge exchange to digital, social, and ecological dimensions in the Southern Rockies

Oral Presentation

The Southern Rockies Fire Science Network (SRFSN) is one of 15 fire science and knowledge exchange consortia within the national Joint Fire Science Program. SRFSN works to serve as a catalyst for identifying key regional wildfire knowledge needs, issues, and science-based solutions to support management decisions. Our region includes a disparate set of ecological environments, covering portions of 5 western states (Utah, Colorado, Wyoming, and the Black Hills region of South Dakota and Nebraska). To address fire knowledge needs from areas such as the Wasatch Range, red rock deserts, "sagebrush seas", dry /mixed conifer, up to the alpine and tundra habitats of the Continental Divide, SRFSN has devised a variety of adaptive methods for outreach and exchange. These including agency, municipal, non-profit and community-based face-to -face events as well as online tools, including web-based portals and pages for science-user exchange of fuels and fire ecology issues, on-site videography, and condensed fire science information tools ("Barriers and Benefits" Series, "Fire Science Hotspots", and 5- minute reference videos). Combined with academic and agency resources throughout the region, these methods assist the development of sound management decisions through the Southern Rocky region.

Ellsworth, Lisa

Lisa Ellsworth is an Assistant Professor in the Department of Fisheries and Wildlife at Oregon State University. Her research focuses on the fire ecology of sagebrush steppe ecosystems and focuses on long temporal and large spatial scales.

Mid-succession fire effects in sagebrush-dominated ecosystems

Oral Presentation

The sagebrush steppe is among the most endangered ecosystems in western North America due to land use change, invasive species, overgrazing, climate change, and altered fire regimes. A large gap in our understanding of ecosystem response to fire in the sagebrush steppe has historically been a lack of data describing mid-succession fire effects. To address this need, we quantified the influence of past fires (12-30 years) on current vegetation composition and fuels accumulation in intact sagebrush plant community types (mountain, Wyoming, and basin big sage and low sage) across the northern Great Basin. Native herbaceous vegetation dominated mid-succession recovery in all communities. Invasive grass cover declined with time since fire, and was low (<3%) in all sagebrush types. Shrub regeneration was evident in all communities, with more woody cover in mesic mountain big sagebrush communities (17-20% cover) 10 years after fires than in arid Wyoming big sagebrush communities (<5%) 17 years after fires. By 25 years after fire, fuel accumulation had not reached levels of unburned controls in any sagebrush community. Collectively, our results describe differences in vegetation and fuels recovery by community type with time since fire but show overall sagebrush ecosystem resilience to fire at long temporal scales.

Ernstrom, Kim

KIM ERNSTROM – Lead Fire Application Specialist – Willdland Fire Management RD&A – Boise, ID Kim began her fire career on the Bridger-Teton NF as a seasonal in 1993 after completing a bachelor's degree in Geography and Geology. She has worked in fire management in eight different states throughout her career. Positions with the US Forest Service, the National Park Service, the US Fish and Wildlife Service and the Nature Conservancy have provided a broad perspective on fire management. Titles such as Helicopter Crewmember, Hotshot Foreman, Prescribed Fire Specialist, Prescribed Fire Training Center Coordinator, Fire Management Officer and Fire Application Specialist round out Kim's resume. While enjoying summers as a fire fighter Kim received her Masters Degree in Earth Science at Montana State University in 1999 completing a thesis on the "Fire effects of the 1988 fires on headwater stream systems in Yellowstone National Park". Kim's fire management interests with the Wildland Fire Management RD&A include advanced fire behavior applications, long term fire planning, decision support and fuels management.

Fire Planning and Fuels Management Resource Portal

Poster Presentation

Fuels Management and Fire Planning leadership (Fuels Management Committee (FMC) and Interagency Fire Planning Committee (IFPC) is improving communication by streamlining information flow! In 2014, an effort began with the purpose of centralizing information relevant to Fuels Specialists/Technicians and Fire Planners. The intent is to replace outdated websites and information with one-stop, up-to-date shopping at the Interagency Fire Planning and Fuels Management Resource Portal. When you visit this portal you will find: • A wide variety of information and useful links ranging from Wildland Fire Policy to Training, Education and Technology Transfer Resources • An avenue to find answers on specific fire management questions one might encounter as a fuels specialist, fuels technician or fire planner. • Career development resources The Wildland Fire Management RD&A is leading the effort with the assistance of FRAMES and the University of Idaho to continue development of the Portal through user feedback and consultation with the FMC and IFPC. Ultimately the Portal will be housed in a location where dedicated permanent staff can manage and maintain its development in a dynamic environment.

Estes, Becky

In 1997, I completed a B.S. in Natural Resources at the University of the South in Sewanee, TN. After working for the BLM in Ely, NV as a range technician I returned to pursue my M.S. degree in forest pathology at Auburn University. It was here that I discovered ecology and after graduating worked for the Southern Research Station. I soon discovered fire ecology and was interested in the fire effects on understory plants and the spatial aspects of fire. In order to further my education, I returned to school to pursue my Ph.D. and study effects of fire on longleaf pine restoration. Following completion of my degree, I began working for the Pacific Southwest Research Station looking at landscape scale effects of fire severity in the Klamath Mountains. Presently, I am the Central Sierra Province Ecologist based on the Eldorado National Forest.

Caples Creek Watershed Fuels Reduction and Meadow Restoration Project

Poster Presentation

The Caples Creek Watershed is primarily managed by the U.S. Forest Service and provides a significant portion of the El Dorado Irrigation District (EID) upper South Fork American River watershed water supply. The Eldorado National Forest identified the watershed as a priority for restorative action. This project will be conducted in collaboration with interested stakeholders to develop viable restoration activities for the watershed and for EID to guide and implement activities that will ensure continued high quality water for the future. The main actions associated with the watershed are the reintroduction of fire and meadow restoration. In order to provide guidelines for the project, the ecological condition of the mixed conifer forests were evaluated using the Natural Range of Variability (NRV) concept. Current mixed conifer stands in the Caples Creek watershed are generally characterized by: greater tree densities especially small trees, increased rate of mortality of large diameter trees, greater basal area, decreased evenness in size class distribution with smaller/medium sized trees being greater than large diameter trees, higher percentage of shade tolerant trees, increased tree canopy cover, decreased shrub cover, increased snag density, greater fuel loading and significant departure from pre-European fire return intervals.

Fairbanks, Richard

Rich Fairbanks, FUSEE. Fairbanks is retired from the Forest Service where he held several positions in the fire organization, including division supervisor and assistant foreman of a hotshot crew. He has served as ID team leader on Forest Service fire recovery projects. He worked five years for the wilderness society. He currently owns a forestry services company. He also teaches fire management courses at a community college. He has a masters degree in planning and a degree in forestry.

Implementing Fire Permeable Landscapes in Southwest Oregon

Oral Presentation

Roughly half of the forests of Jackson and Josephine County will support crown fire on an average day in fire season. These counties have extensive Wildland Urban Interface with wood frame houses in a checkerboard with lands managed by the BLM. Fires burn large acreages almost every year now in southwest Oregon. It may be time to admit that suppression is not working and allow fires to burn in a planned sequence. There are large windows in fall and spring where fires will burn on one aspect, go out on another. Blocks of forest are bounded by an extensive logging road system. There are numerous complexes of meadow and rock at high elevations. Allowing fire to burn within such blocks is thoroughly feasible and reasonably safe in spring and late fall. The goal would be to restore fire season to pre-suppression timing. This in turn would distribute fire severity more evenly, with low severity fires allowed to burn. Further, managing early and late season fires would allow for safe, managed, budgeted management of fire as opposed to the current panicked, emergency atmosphere. Plans would be collaborative with local communities.

Farfan , Michelle

Michelle Farfán Gutiérrez IIES-UNAM Michelle Farfán Gutiérrez is Ph.D. in Geography at Instituto de Investigaciones en Ecosistemas y Sustentabilidad, UNAM, Campus Morelia. Her research focuses on development of spatial models that integrate human and environmental factors. She has three publications in Journals of Geographic Information System. And she has given specialized courses using DINAMICA EGO software at different universities of Mexico.She is currently interested in tropical fire modeling. Nowadays it is known that there is a synergy between processes like deforestation, logging and land management practices, they all associated with the use of fire at the tropical forest ecosystems. Despite the striking impacts of such practices, the use of forest fire modeling approach are still in early stages of development by making it a priority to address.

Modeling anthropic drivers as sources of fire occurrence (2009-2013) at the Monarch Butterfly Biosphere Reserve.

Oral Presentation

Forest fires occurrence have not been considered a significant threat for the mountain forests located at the Monarch Butterfly Biosphere Reserve (MBBR). However, global changes according to demands of society and the general trends in the provision of ecosystem services may have significant effects on forest fire ignition. In this regard, assessing the contribution of the anthropic and environmental factors which drive the occurrence of forest fires is critical for the effective planning of fires' management and prevention policies. In the present study, we identified the drivers of fire occurrence and modeled its spatial pattern through generalized linear mixed models. We employed fire events data (2009-2013) and the spatial distribution of anthropic (population and road density, land uses and biomass removal by forest management, such as standing dead trees and stumps) and environmental variables (forest biomass, slope) related to fire occurrence in the MBBR. We found fire occurrence is greater where the density of dead trees and stumps increases. The accuracy of the derived spatial model of fire occurrence was low, according to the validation data of 2014 fire events. We encourage to develop management guidelines aimed towards reducing the risk of fire occurrence during the biomass removal practices within the MBBR.

Ferster, Colin

Colin Ferster is a post-doctoral fellow at the University of British Columbia Department of Forest Resources Management. Dr. Ferster's research interests involve innovative ways of collecting, integrating, analyzing, and visualizing data to better understand our forests and how we interact with them.

Relationships between crown mortality, pre-fire vegetation, topography, and fire weather within natural wildfires in the western Canadian boreal forest

Oral Presentation

The percent of crown mortality can be highly variable within a fire event. Understanding how this variation relates to pre-fire stand conditions, topography, and fire weather can help forest managers plan stand treatments or harvests that take into consideration natural wildfire processes. In this research, data were collected for pre-fire vegetation, topography, fire weather, and percent crown mortality for 37 fire events with minimal pre-fire disturbance and minimal fire suppression covering a wide range of conditions in the western Canadian boreal forest. Multinomial logistic models were built to determine the importance of stand condition, topography, and fire weather variables on percent crown mortality classes. Ecoregion, a composite classification of vegetation, physiography, and climate variables, was the single most important variable, representing regional trends in fire behaviour. At finer spatial and temporal scales, areas with high soil moisture, low drought codes (seasonally wet conditions), low conifer crown closure, and high broadleaf crown closure had lower crown mortality. These findings indicate that ecological classifications can provide broad guidelines for management, while more detailed and dynamic variables further help explain variation in crown mortality.

Finney, Mark

Mark Finney, Research Forester, USFS Missoula Fire Sciences Laboratory. Mark has been conducting fire behavior research since 1993 concerning fire simulation, fuel treatments, fire risk modeling, and fundamental processes in flame spread.

Towards understanding wildfire – lessons from fire protection engineering

Oral Presentation

Our explorations of the fundamental heat transfer and combustion processes in wildland fires have suggested some practices found in fire protection engineering that would be useful also to the pursuit of the science of wildland fire behavior. If adopted, the practices could contribute greatly to the advancement of understanding, prediction, and collaboration in wildfire sciences. The overarching goal would be to develop a confirmed theoretical basis for wildfire behaviors, including spread, burning rate, residence time, live fuel ignition and combustion. Currently we lack this theory, and modeling suffers without a reliable physical foundation. To bring wildland fire to the level of fire protection sciences, wildland fire will need a canonical set of experiments that offer repeatability for laboratory and field studies among groups worldwide. Such experiments can attract worldwide collaboration in understanding spread with wind, slopes, and with flow restrictions (canyons), radiant and convective heat transfer, ignition of particles and groups of particles, burning rate and residence time of standard fuel configurations, live fuel ignition and combustion testing. A reinvestment in addressing fundamentals and will support the ultimate goal of improved wildland fire management and physical modeling.

Studies of flame spread mechanisms in cardboard fuel beds: comparison of wind and slope

Oral Presentation

To understand flame spread in wildland fires, laboratory experiments have been conducted using laser-engineered cardboard fuel beds. Uniform and repeatable fuel beds allow heat transfer mechanisms of flame spread to be investigated without complication of heterogeneous fuel conditions. The experiments conducted in the wind tunnel have permitted us to recognize fluid behaviors known as buoyant instabilities which, counter-intuitively, force flames downward in contact with fuel particles and deflect flame bursts forward into the fuel ahead of the flame zone. These two instabilities provide the needed convective heating and ignition of fuel particles. We undertook more experiments in the absence of wind on sloping surfaces and the same flame behaviors were observed. This lends further support to our interpretation that convective heating is based on mechanics of strongly buoyant fluids in the forced flow of wind-driven flames and induced-flows on slopes.

Flannigan, Mike

Mike Flannigan is a professor with the Department of Renewable Resources at the University of Alberta and the director of the Western Partnership for Wildland Fire Science. He received his BSc (Physics) from the University of Manitoba, his MS (Atmospheric Science) from Colorado State University and his PhD (Plant Sciences) from Cambridge University. Dr. Flannigan's primary research interests include fire and weather/climate interactions including the potential impact of climatic change, lightning-ignited forest fires, landscape fire modelling and interactions between vegetation, fire and weather.

Climate Change and Wildland Fire

Oral Presentation

Wildland fires are a frequent occurrence in many regions of the world. These fires are the result of interactions between climate/weather, fuels, and people. Our climate and associated day-to-day weather may be changing rapidly due to human activities that may have dramatic and unexpected impacts on regional and global fire activity. Existing studies suggest a general overall increase in area burned and fire occurrence although there is a lot of temporal and spatial variability. Future trends of fire severity and intensity are more complicated due to the complex and non-linear interactions between weather, vegetation and people. However, there are indications that fire severity and intensity are increasing. Fire severity is of importance to water in terms of runoff and erosion. A warmer world means a longer fire season, more lightning activity, and most importantly drier fuels that makes it is easier for fires to start and spread. Recent research suggests that changes in the jet stream may result in more extreme weather that will lead to more fire activity. Land management and fire management will be even more challenging in a warmer world.

Flatley, William

William Flatley is a Postdoctoral Scholar in the School of Forestry at Northern Arizona University. His research examines the influence of climate and disturbance on forest dynamics in landscapes of the Appalachian Mountains and the Southwestern US. His research methods include dendrochronology and landscape simulation modeling.

Modeling vegetation response to future climate and fire regimes at the Grand Canyon

Oral Presentation

The re-institution of historical fire regimes is often a primary objective in the conservation of fire adapted forests. However, individual species' responses to future climate change could uncouple historical vegetation-disturbance relationships, producing unforeseen and potentially negative ecological consequences to restoration burning. We employed the forest landscape simulation model LANDIS-II to model pi on-juniper, ponderosa pine, mixed conifer, and spruce-fir forests within the 300,000 hectare Kaibab Plateau landscape. Our objective was to assess the effects of climate change and fire on forest conservation over multiple centuries. Model simulations incorporated three climate scenarios (current, moderate change, and high change) and two fire scenarios (fire exclusion or fire restoration). Both climate change scenarios resulted in a decline in aboveground live biomass (AGB) and a compositional turnover equivalent to one or two vegetation zones. Efficacy of fire restoration varied along the vegetation-elevation gradient. Fire restoration resulted in earlier AGB declines and compositional change. However, uphill species migration in some elevation zones produced tree species-fire regime mismatches that promoted state changes and increased non-forest area. Regardless of fire management approach, our simulations project that the Kaibab Plateau will eventually be dominated by pi on-juniper and ponderosa pine forest types, with a complete loss of mesic conifer species.

Does Fire Suppression Alter Ecosystem Services Provided by Frequent Fire Conifer Forests Across North America?

Oral Presentation

Many conifer-dominated forests in North America are characterized by and adapted to relatively short fire return intervals (<35 years), and frequent fires historically played an important role in maintaining the ecosystem services these forests provide. We reviewed literature addressing three primary ecosystem services provided by frequent-fire conifer forests (FFCFs): water, biodiversity, and carbon sequestration, and we compared the quality of these ecosystem services when FFCFs are subjected to frequent fires versus fire suppression. We examined a range of FFCFs in North America (longleaf, slash, shortleaf, and ponderosa pines) with the goal of identifying possible universal positive or negative impacts of frequent fire. We found that frequent fire generally increases water yield and promotes native plant and animal understory diversity. It also decreases carbon sequestration in the short term but likely increases it over longer time scales. However, the magnitude of improvement in ecosystem services provided by frequent fire differed substantially within and among FFCFs due to differences in abiotic factors such as previous burning regimes, soil-types, precipitation, topography, and land use history.

Fornwalt, Paula

Paula Fornwalt is a Research Ecologist for the USDA Forest Service's Rocky Mountain Research Station in Fort Collins, Colorado, USA. Her research examines how natural and human disturbances impact plant populations and communities in Rocky Mountain forests.

Mulching treatment impacts on understory plant composition in Colorado coniferous forests

Oral Presentation

Forest mulching (or mastication) treatments reduce overstory tree density by chipping or shredding small-diameter trees and broadcasting the woody material on the ground. We initiated a study in 2007 to examine the effects of mulching treatments on a variety of ecosystem properties and processes, including understory plant composition. We established 17 sites across Colorado, in lodgepole pine / mixed-conifer, ponderosa pine, and pinyon pine – juniper forests. Sampling occurred 2 to 4 years post-treatment, and again 6 to 9 years post-treatment, in mulched and adjacent untreated stands. Preliminary results indicate that understory plant composition differed somewhat between mulched and untreated stands, with the strongest differences observed during the 6 to 9 year post-treatment sampling period. Only a few species had higher abundance in untreated than mulched stands. In contrast, mulched stands favored several species; these species tended to be native, but some were non-native. These findings, combined with our other understory plant findings of increased richness and cover in mulched stands, suggest that understory plant communities in Colorado coniferous forests can benefit from mulching treatments.

Does smoke promote seed germination in Penstemon (Scrophulariaceae) species?

Oral Presentation

Recent research has shown that exposing seeds to smoke stimulates germination for a multitude of plant species, including several species in the genus Penstemon (Scrophulariaceae). I evaluated whether smoke, either alone or followed by 10 weeks of stratification, influenced germination for 10 Penstemon species native to the Interior West of North America. I found that percent germination for 3 species, P. secundiflorus Benth., P. strictus Benth., and P. unilateralis Rydb., increased in response to smoke, with smoke-exposed seeds exhibiting 1.9-, 2.5-, and 1.7-fold greater percent germination than those of non-smoked seeds, respectively. Increased germination in P. unilateralis was only observed for seeds that had also been stratified, while increased germination for P. secundiflorus and P. strictus was observed for both stratified and non-stratified seeds. I also found that percent germination for 6 species, P. auriberbis Pennell, P. eriantherus Pursh, P. glaber Pursh, P. rydbergii A. Nelson, P. secundiflorus, and P. strictus, was stimulated by stratification. These findings improve our understanding of smoke's role, as well as stratification's role, in Penstemon germination ecology, and should be of use to those who wish to propagate Penstemon species for restoration, horticultural, research, and other purposes.

Foshag, John

John Foshag is currently going to school for his undergrad in Wild Land Fire Science as a student at the University of Wisconsin Stevens Point. This summer John worked in Tomahawk observing the effects and influence of thinning, fire season and fire frequency on small mammal community dynamics. John is hoping to pursue a masters in fire ecology after his undergrad and hopes to continue his interests in wild land fire behavior to help increase awareness in the benefits fire has to offer.

Fire Effects on Great Lake States Small Mammal Populations

Student Poster Presentation

Abstract: We examined the influence of thinning, fire season and fire frequency on small mammal community dynamics. This longterm study was composed of eight replicated treatments randomly assigned to 24 units. We used Sherman live traps to capture small mammals for 2,304 and 2,016 trap nights in 2014 and 2015 respectively. In 2014 we had a total of 12 species and a total of 337 captures. In 2015 we had a total of 9 species and a total of 484 captures. This study suggests that thinning and burning may increase mammal diversity. Over three years of burning, a significant increase in eastern chipmunk (Tamias striatus), red back vole (Myodes rutilus), and the deer mouse (Peromyscus maniculatus) has occurred in 2015. The most abundant mammal caught in 2015 was the eastern chipmunk. Species richness varied from a low of two, to a high of six in a unit. The results suggested a positive association between small mammal species richness and percent cover of coarse woody debris. Eastern chipmunk (Tamias striatus) presence was positively associated with plant species richness, while negatively associated with higher trees per acre, (Peromyscus maniculatus) has occurred along with an overall increase in small mammal diversity.

French, Nancy

Dr. French researches applications of remote sensing to ecology and vegetation studies. French's primary interests are in the study of forest ecosystems and the application of remote sensing techniques focused on wildfires and their effect on the structure and function of forest ecosystems and implication to carbon cycling. Dr. French is Principal Investigator for MichiganView, a part of AmericaView. She serves on the Editorial Board and as Assistant Editor for the International Journal of Wildland Fire and serves as the chair of the IAWF scholarship committee. She is a member of the North American Carbon Program Science Steering Group.

An Assessment of the Causes and Impacts of Recent Fire Regime Changes in the Boreal Forest Region of Western North America

Oral Presentation

Over the past half century, there has been a sharp increase in average annual area burned in the boreal forest regions of western North America, from 1 million hectares per annum during the 1960's to more than 3 mha-a-1 during the 2010's. In this paper, we review possible reasons for this dramatic increase in fire activity, including the role of increased temperature, large-scale atmospheric circulation, human ignitions, and fire management strategies. We will discuss spatial and temporal patterns of mega-fire activity that occur periodically at sub-regional scales, such as the 2004 fire season in Alaska/Yukon, and 2014 fire season in the Northwest Territories. We will also review factors contribute to variations in fire severity including fire behavior at the time of burning, seasonal variations in permafrost conditions, and longer-term drought. We focus in particular on the burning of thick organic layers common to the forests and peatlands of this region that have significance for seedling recruitment, carbon cycling and ground thermal conditions. Finally, we will identify some of the key changes that are occurring to terrestrial ecosystems, including post-fire vegetation reestablishment that can trigger ecosystem shifts as a result of modification to climate and interactions with the fire regime.

Mapping fire occurrence, severity, and impacts on land surface albedo in tundra regions

Poster Presentation

Fire in tundra regions has recently received increased research attention. Compared to more fire-prone biomes, little is known about the effects of fire on ecosystems in this region of low fire occurrence, but that is changing as old research is accessed and new studies are conducted on tundra fire ecology. The concern that is driving this new attention is the potential increase in fire that could lead to dramatic changes in ecological structure and function with impacts on carbon and energy cycling as well as land use and ecosystem services. We review results from research funded by the NASA Terrestrial Ecology Program on remote sensing to understand fire occurrence and severity. The presentation will focus on a study to investigate the impact of fire on albedo and energy balance at two sites on the North Slope of Alaska. The research shows that fire has a dramatic impact on surface shortwave forcing through modification of albedo, and that the impact on albedo can persist for several years following fire. The poster will present a review of what is known related to fire effects and what is still not well quantified in this vast region.

Friggens, Megan

Megan Friggens, Ph.D., is a Research Ecologist within the Rocky Mountain Research Station (USFS) where she studies the impacts of human and natural disturbances on wildlife and habitats. Her recent accomplishments include the development of an integrated modeling framework for assessing species' vulnerability to the interactive effects of changing climate and fire regimes.

A GIS-based model for predicting wildfire-caused damages to archaeological sites and artifacts

Oral Presentation

To effectively preserve archeological sites in fire-prone landscapes, archeologists must be able to identify which sites are most at risk of damage during and after wildfires. We assessed how well bottom-up controls of burn severity predict observed site and artifact damage to better understand the relationships between site characteristics and fire impacts. Specifically we wanted to determine whether topography and vegetation characteristics influence burn severity and fire effects on archeological sites. We also compared MTBS burn severity data with field-measured archaeological burn severity to determine whether satellite derived measures are reasonable predictors of fire damage to cultural resources. Our analysis is based on data collected during post-fire surveys of 284 prehistoric and historic sites within the Jemez Mountains in New Mexico. These sites burned during one of four fires: the 2002 Lakes Fire, 2003 Virgin Fire, the 2011 Las Conchas Fire and the 2013 Virgin Canyon Fire. We found that Existing Vegetation Cover (Landfire) and the Compound Topographic Index (calculated) were most useful for predicting archaeological burn severity. Ultimately, we will use the results of this analysis in combination with a debris flow model to generate risk maps (fire and erosion) for archeological sites within the Jemez Mountains.

Fuhlendorf, Samuel

Sam Fuhlendorf is currently Regents Professor and holds the Groendyke Chair in Wildlife Conservation at Oklahoma State University. He has published over 100 peer-reviewed articles in international journals, such as Science, Bioscience, Ecosphere, Journal of Wildlife Management, Journal of Applied Ecology, Conservation Biology, Ecological Applications, Proceedings of the National Academy of Science, and Rangeland Ecology and Management. His favorite role is being a dad to his daughter Catie and a grandfather to her children- Jaden, Kai and Laney.

Pyric Herbivory on Grasslands: Innovation through JFSP

Oral Presentation

Joint Fire Sciences Program has provided critical funding through a series of grants that have allow us to develop an innovative understanding of fire on grasslands that links fire and grazing through a process known as pyric herbivory. Fire and grazing are strongly interactive where forage and fuel are not competitive ecosystem components but rather interactive where burned areas have a strong attraction to herbivores for higher quality forage. If allowed to interact in space and time fires attract herbivores to recently burned areas enhancing the impact of fire on reducing fuel loads. Funding from JFSP was critical and developing this research and applying to landscapes throughout the Great Plains and in British Columbia, South Africa and Australia. We will present a summary of this research and an overview of some of the landscapes where these processes are being applied and studied.

Fulbright, Timothy

Timothy E. Fulbright, Meadows Professor in Semiarid Land Ecology, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville. Timothy (Tim) has been a professor at Texas A&M University-Kingsville since 1981. He has coauthored 3 books including "White-tailed deer habitat: ecology and management on rangelands." He is an associate editor of the Wildlife Society Bulletin. He has received numerous awards including the Sustained Lifetime Achievement Award from the Society for Range Management in 2015.

Fire Effects on White-tailed Deer

Oral Presentation

Fire effects on white-tailed deer (Odocoileus virginianus) vary depending on climate, vegetation, and the intensity and extent of the fire. Demographic responses of deer to fire are not well documented; in one case in the Texas

Coastal Bend fawn production increased following prescribed fire. Fire can result in temporary increases in palatability, quality, and quantity of deer forages. In addition, fire may benefit deer by reducing ticks. Presence of burned areas influences spatial movements and patterns of habitat use by deer. In some cases, deer avoid burned areas because of a temporary loss of cover and forage. Sexes may differ in seasonal preferences for burned areas. Patch burning may be a potential tool for improving deer habitat in shrublands. Periodic drought, however, may override fire effects on habitat use by deer in the semiarid portion of their range. Fire may also result in increased cover of non-native grasses resulting in reduced forb production. Fire as a management tool for white-tailed deer habitat should be applied with careful planning; in particular, sufficient woody plant canopy cover should remain to provide hiding and thermal cover for deer.

Fulé, Peter

Peter Fulé, Professor, Northern Arizona University, studies interactions of forests, fire, and climate in dry coniferous ecosystems in many regions of the world.

Applying Fire Ecology Research for Management at Grand Canyon

Oral Presentation

Grand Canyon National Park has been a leader in the NPS and the Southwest in terms of restoring historical patterns of fire. Building on early research and monitoring results, the Park began to use fire in the 1970s and 80s, mainly in ponderosa forests. JFSP-sponsored research in the 90s and 00s provided data to extend studies to mixed-conifer and spruce-fir landscapes. These data were used to inform management planning and to help guide fire use. Currently, fires are managed over large and diverse landscapes, creating new research questions. The JFSP was not the earliest or the only source of research data, but the JFSP funding help address key questions at the appropriate scale at the right time. A history of close cooperation between resource managers and academic researchers also facilitated the development of practical research questions and the rapid and productive application of research findings in management.

Fire Regimes Can Be Conserved In Protected Areas: Examples from México

Oral Presentation

Protected areas (PAs) are often designated to conserve unique species, habitats, or landscapes that depend on disturbance regimes. PAs maintain ecological processes at multiple scales and provide irreplaceable ecological information for management. Mexico has a number of PAs dominated by temperate forests that are strongly influenced by fire. Empirical data from fire-regime reconstructions show that many of these sites retain patterns of fire similar to those that prevailed for centuries in the past. In these sites, fire continues to play its ecological roles, regulating species composition, forest structure, and fuel beds, making these ecosystems relatively resilient to large-scale severe burning. Modern fire exclusion, where it exists, is notably shorter in extent and less uniform than elsewhere in North America. The network of PAs in México provides valuable scientific insights for managing other fire-dependent systems in the face of changing climate and increasing pressure on natural resources. However, maintaining historical fire regimes requires explicit public policies that support fire management, as well as building public support through education and outreach.

Gallacher, Jonathan

Jonathan R. Gallacher is a PhD student in the Chemical Engineering Department at Brigham Young University in Provo, Utah. He received a BS in Chemical Engineering at BYU in 2011, and worked at Celanese Corporation in Houston, Texas, for almost 2 years before starting graduate school. He will graduate in 2016.

The Effect of Heating Mode on the Ignition and Burning Behavior of 10 Live Shrub Fuels

Oral Presentation

It is often assumed that radiation is the dominant form of heat transfer in wildland fires. While this is generally accepted for large fires or fires with no wind, recent work has shown that this is not the case for fires in which live shrubs are the dominant fuel type. In this work, the burning behavior of 10 species of live fuels was measured over a one-year period with different heating modes, namely convection-only, radiation-only and combined convection and radiation. Transient flame characteristics, surface temperature, and mass data were collected and analyzed to determine the effect of heating modes on ignition and burning. Leaf species experienced a significant increase in burning rate when convection and radiation were used together compared to convection alone. Needle species showed no significant difference between convection-only and convection combined with radiation. The transient mass and temperature curves showed a marked change throughout the growing season of each species when exposed to convection or convection plus radiation, while fuel samples exposed to radiation-only exhibited similar mass and temperature curves throughout the year. In all experiments, radiation alone was not sufficient to ignite the fuel sample. These results have important implications for next-generation fire models and fire management strategies.

The Ignition and Burning of Live Fuels Studied Using Natural Variation in Fuel Characteristics

Oral Presentation

The current state of knowledge on fire behavior in live fuels is lacking; recent studies generally conclude either live fuels are different than dead fuels or that models used to predict fire in dead fuels are not adequate to describe fire in live fuels. In this work, the burning behavior of 10 species of live fuels was measured each month for one year. Moisture content, relative moisture content, mass, size, shape, ether extractives, volatiles content, and ash content were measured. Transient flame characteristics, surface temperature and mass data were collected and analyzed to determine which of the chemical or physical properties, if any, influence fire behavior in live fuels. Several important conclusions are evident from the analysis, namely (1) ignition and burning behavior cannot be described using single-parameter correlations similar to those used for dead fuels, (2) moisture content, sample mass, apparent density (broad-leaf species), surface area (broad-leaf), sample width (needle species) and stem diameter (needle) were identified as the most important predictors of fire behavior, and (3) volatiles content, ether extractives, and ash content are insignificant predictors of fire behavior under the conditions studied. These results have important implications for next-generation fire models and fire management strategies.

Ganio, Lisa

Dr. Ganio is an Associate Professor in the College of Forestry at Oregon State University. She has researched logistic regression models for natural resource applications for the past 20 years. Recently she collaborated on three studies of logistic regression as a discriminatory tool for post-fire mortality and has authored 3 papers on this subject. She oversees the Statistical Consulting Practice in the College of Forestry at OSU and teaches courses on generalized linear and mixed models.

Mortality classifications of large fire-injured Douglas-fir and ponderosa pine in Oregon and Washington using logistic regression

Oral Presentation

Wild and prescribed fire induced tree injury can produce mortality that is not immediately apparent and logistic regression models have been extensively used by land managers to identify fire-injured trees that will die within a few years or ultimately survive. We use data from 4024 ponderosa pine and 3804 Douglas-fir trees from 23 fires across Oregon and Washington to validate 22 existing logistic regression fires, build a new model and identify variables which consistently contribute to good predictions. The percent of the crown volume used, the number of dead cambium samples (out of four) and the presence of bark beetles were present in models that classified most accurately. For ponderosa pine, our model and the Malhuer model (Thies et al. 2006) correctly classified live trees more than 95% of the time and mistakenly classified dead trees as live more than 75% of the time. For Douglas-fir, live trees are correctly classified 69.6 % of the time and dead trees are mistakenly classified as live 35.5% of the time. Classification error rates are controlled by the choice of decision criteria and managers are encouraged to consider costs of the two types of misclassifications when choosing their own decision criteria.

Gannon, Benjamin

Ben completed his MS in Ecology at Colorado State University where he worked in the Landscape Ecology Lab studying the impacts of hurricanes on tropical montane forests. He employs knowledge of forest ecology and skills from dendrochronology, GIS, and remote sensing to answer management-driven questions relating to disturbance of forest ecosystems. He is currently a research associate with the Colorado Forest Restoration Institute where he runs the Front Range Forest Reconstruction Network alongside many collaborators. His interests include fire ecology and fire history, especially the interaction between pattern and process at stand-to-landscape scales.

Structural reference conditions for Colorado Front Range ponderosa pine forests

Oral Presentation

National and local level management directives have increased the rate and scale of treatments aimed at restoring ponderosa pine-dominated forests of the Front Range. The desired conditions of a restored Front Range ponderosa pine forest have been intensely debated, having been informed by a pool of local research that only partially describes the historical ranges of variability of key ecosystem structures and processes, and therefore draws heavily from studies done in other parts of ponderosa pine's extensive range. We describe a current project, the Front Range Forest Reconstruction Network (FRFRNet), which was designed to characterize patterns of historical forest structure and fire across the entire range of ponderosa pine in the Front Range so that restoration treatment prescriptions can be more fully informed. FRFRNet consists of 179 0.5 ha plots with data collected on current and historical (ca. 1860) forest structure (density, basal area, size and age distributions, composition, stand spatial patterns) and fire history. We present here the regional trends in current and historical forest structure from FRFRNet and discuss the influence of environmental and disturbance gradients on historical forest structure.

Ganteaume, Anne

Dr Anne Ganteaume is currently a researcher at Irstea, a French public research institute involved in environmental science and technology. She works on forest fires in the department "Mediterranean ecosystems and risks" located in Aix-en-Provence (SE France) since 2006. She received a PhD in Ecology from the University of Aix-Marseille in 1993. She is involved in several European research projects, sometimes as team leader or coordinator. Her research interests are the fuel characterization, fuel flammability and fuel combustibility, forest fire causes and fire risk assessment.

Can ranking the flammability of ornamental species be used for the fire risk assessment in WUI ?

Oral Presentation

In WUI, the ornamental vegetation is an efficient vector of fire propagation towards the housings. One way to assess the fire risk around housing is the ranking of the flammability of the ornamental species. The objective of this work was to show if the ranking of the flammability of the species varied between live and dead fuels of the main ornamental species in SE France. Flammability variables were recorded during burning experiments using a fire bench for litters and an epiradiator for live leaves. For both types of fuel, the different species were ranked from the least flammable to the most flammable according to these variables. The rankings were compared together as well as to the "total" ranking obtained using the variables of live and dead fuels. The main results showed that a few species presented the same ranking regardless of the type of fuel. However, for most species, the ranking of litter flammability differed from that of live leaf flammability; the litter of some species being ranked more flammable than their live leaves or the opposite. For the "total" ranking of these species, the most flammable species corresponded to the species presenting the most flammable litters and the moderately flammable ones to those of moderately flammable live leaves. However, the poorly flammable species corresponded to species either with highly flammable litters or moderately flammable live leaves. Among the least flammable species, Ligustrum japonicum presented litters ranked as highly flammable. The underestimation of the flammability of some species in the "total" ranking can be an issue in the fire risk assessment.

García-Frías, Aída

Aida A. García-Frías studied journalism at the University of Guadalajara and she is the producer of the radio news program in Radio Universidad de Guadalajara-Autlán.

Fire ecology and management from a journalism perspective

Student Poster Presentation

Communication is an often-neglected component of fire management. Around the world, and Mexico is no exception, the prevailing perception is that wildfires are a disruption of the balance of nature and a cause of forest degradation. Mass media frequently reinforce this perception. With the goal to contribute to a better understanding of fire ecology concepts and the ecological foundation of fire management, from a journalism perspective, we conducted a study of press coverage on wildfires in the state of Jalisco, Mexico, and a series of interviews with journalists, stakeholders involved in fire management and the general public. Over 95% of the published press reports refer to the "devastating effects" of wildfires and refer to firefighting activities and policy statements about fire suppression. In general the public is unaware of the ecological role of fire and fire management concepts. Most stakeholders (protected area managers, forest service employees, and also some researchers and conservationists) are still unconfident with fire management. Our results indicate that to achieve the transition from fire suppression to fire management, better communication through environmental and scientific journalism is required.

Garduño, Erika

Erika Garduño, Victor Hugo Garduño and Diego Perez, are the inter-institutional and interdisciplinary group of work that studies the geological and environmental risks. Are two educational institution whose mission is to conduct scientific research, human resources training and links with the society.

NATURAL REGENERATION OF A CONIFEROUS FOREST AFTER GEOLOGICAL AND ENVIRONMENTAL CATASTROPHIC EVENTS

Poster Presentation

In the municipality of Mineral de Angangueo, Michoacán, Mexico, has occurred catastrophic geological and environmental phenomena of low, medium and high magnitude associated with torrential rains. As a result of these phenomena were exposed hillsides and riverbeds, which allowed studying the sediments of ancient deposits of mega fires. By lifting stratigraphic columns and dating of sediments by means of 14C, it is identified the age of these. Subsequently a dendrochronological sampling was performed to date the forest of this area, dominated by Pinus pseudostrobus, by sampling trees in cross section and cores trees for counting growth rings. According to the stratigraphy raised in the area of catastrophic fires strata dated to 1670 and 1883 they were identified by 14C. Forest age by counting growth rings of trees, ranging from 118 years (1893-2011) was determined. It was concluded that after catastrophic events such as landslides and fires, the forest has regenerated naturally.

Generation a Plan of Integrated Fire Management in The Monarch Butterfly Biosphere Reserve: Action and participatory adaptive research.

Poster Presentation

The Monarch Butterfly Biosphere Reserve (MBBR), one of the most iconic Natural Protected Areas in North America, has a governmental mandate to develop the Plan of Integrated Fire Management (PIFM). Unfortunately the background and information for developing such plan are scarce. In coordination with The Mexican Fund for Conservation of the Nature, the nongovernmental organization Alternare AC and the Institute of Ecosystems and Sustainable Research of the National Autonomous University of Mexico, we have established a strategy for the development of this PMIF, which is participatory and adaptable to specific and dynamic conditions of the RBMM. With the development of participatory workshops, with the collaboration of brigades of professional and volunteer firefighters, landowners, government agencies, nongovernment organizations and academics, we obtained information from this different groups related with the fire management in the MBBR. This has resulted in planning strategies to the prevention and combat of wildfires and the PMIF generation. This project also involves developing a plan for prescribed burns by the forest fuels management. With the execution of this PMIF is expected to directly benefit 13,500 people living in the communities of the MBBR and therefore also the habitat of the monarch butterfly will be protected.

Godoy, Maria

Maria Marcela Godoy is forest engineer who works at the Forest Research and Extension Center in Patagonia, and is teaching assistant of forest ecology at the National University of Patagonia San Juan Bosco in its branch located in Esquel, Argentina. The main research areas she works on are fire history and fire ecology and management in Patagonian temperate ecosystems. She is also enthusiastic and well skilled in applying prescribed fire to reduce fuel loads on either conifer afforestations and/or fire sensitive WUI areas in Andean Patagonia.

Prescribed burning in a Douglas-fir afforestation of Patagonia, Argentina: an experience of learning by doing

Poster Presentation

While exotic conifer afforestation is increasing in the forest-steppe ecotone of Patagonia, Argentina, prescribed burning still remains as a rare silvicultural practice. In this study, we conducted at El Foyel, Patagonia, Argentina, a prescribed burning aimed at reducing pruning and thinning residues, teach and train fire practitioners, and diminish the risk of unwanted fires. The burn comprised a 4 ha Douglas-fir stand 29 years-old with 250 trees ha, surrounded by native vegetation and unmanaged pine afforestations. Total biomass of residues was 37 t ha (2.5 t ha of fine, 10.8 t ha of medium, and 23.7 t ha of coarse fuels). The burn was carried out in late winter, when mid-day temperatures ranged from 10 to 17 °C, relative air humidity was 30-45%, and maximum wind speed 4.3 km h. Fire behavior remained under prescription, and the burn reduced fine fuels by 60%, medium fuels by 40% and coarse fuels by 23%. One growing season after burning, treated stand tree mortality was less than 1%, and its understory was covered of herbs, grasses, and natural Douglas-fir regeneration. While this burn was a success, more small scale, experimental prescribed burns should be conducted before generalizing this practice to other Patagonian afforestations.

Godwin, David

David Godwin is the Program and Outreach Coordinator for the University of Florida Southern Fire Exchange. Since 2013, he has led outreach programs for the Southern Fire Exchange through the development of wildland fire related webinars, fact sheets, field workshops, newsletters, website content, social media, videos, and presentations to various professional groups. He holds a B.S. in geography from the Florida State University and a M.S. and Ph.D. from the University of Florida in fire science and forest resources. He is a member of the Association for Fire Ecology, founder of the University of Florida Student Association for Fire Ecology chapter, a steering committee member of the North Florida Prescribed Fire Council and chairman of the Conservation Committee of the Boy Scouts of America Suwannee River Area Council.

Private Landowners, NGOs, and Government Agencies: OH MY! Strategies for Addressing Diverse Fire Science Needs

Oral Presentation

Across the southeastern US, natural resource and fire managers are a highly diverse group. In contrast with the vast federally managed landscapes of the western US, southeastern landscapes are a mosaic of industrial, NGO, and public lands within the 87% privately owned forested landscape. Even public ownership within the Southeast is diverse, representing a range of local, county, state, and federal agencies with various management objectives (e.g. industrial forestry, wildlife, watershed protection, recreation, restoration). Interestingly, most landowners and managers recognize the importance of fire as an ecological imperative, even if they are not comfortable with using it. To support the wildland fire science needs of this diverse, fire-prone and fire-dependent region, the Southern Fire Exchange (SFE) has developed a suite of outreach and communication programs that have been shaped by stakeholder surveys, experience, and feedback from an advisory board of regional wildland fire experts. Through active partnerships with Prescribed Fire Councils and other organizations, SFE has designed activities in order to connect with the diverse array of fire managers across the region. These partnerships have produced field tours, workshops, and products which address local fire science information needs, but more importantly, bring together the variety of practitioners to foment further collaboration through identified common goals and solutions to challenges.

Gosford, Robert

Robert Gosford is the moderator of the Ethnoornithology Research and Study Group. He has conducted conducted ethnoornithological research in Australia and internationally since 2001 and from 2005 has organised and presented at numerous ethnoornithological and ethnobiological symposia and sessions at international ethnobiology, anthropology and ornithological conferences and congresses. He has particular interests in the application of Australian Aboriginal knowledge in practical land management and in the development of field methodologies for the application of indigenous ornithological knowledge. He has been researching Aboriginal fire knowledge since 2012.

Ornithogenic fire – birds as propagators of fire in the Australian savanna

Oral Presentation

Birds have long been regarded as key taxa for the study of the impact of fire in the Australian savanna woodlands, with most studies concentrating on the effect of fire upon bird populations and their habitats. Fire in Australian savanna woodlands--and the rest of the Australian continent--has two commonly accepted sources, anthropogenic and lightning. Here we examine the as yet elusive--but compelling--evidence that two common Australian raptors, the Brown Falcon (Falco berigora) and the Black Kite (Milvus migrans), are responsible for intentional fire propogation in Australian savanna woodlands. Australian Aboriginal traditional knowledge and management of the Australian environment, long derided as having no scientific validity, is increasingly being accepted as a key element in contemporary land management. In this presentation we will present an analysis of anthropological, linguistic and first-person reports of birds as fire-starters, the role of birds and fire in traditional Aboriginal ceremonies and legend, the significance of this knowledge to local Aboriginal people and the potential implications of this research for fire management in Australian savanna woodlands and beyond. Proposals for further field research will be discussed.

Grauel, William

William (Bil) Grauel Fire Ecologist Bureau of Indian Affairs Bil served the San Carlos Apache Tribe as Fire Use Specialist from 2004 until 2012. He is qualified as a Burn Boss Type 2 (RXB2) and a Long Term Fire Analyst (LTAN) and earned a PhD in Interdisciplinary Ecology from the University of Florida in 2004. Duane Chapman Fire Management Officer San Carlos Agency, Bureau of Indian Affairs Duane is a San Carlos Tribal member and worked on the Geronimo Hotshot crew including two years as Superintendent. He brought his wildfire experience to the San Carlos Fuels Management program as Lead Fuels Technician, took ecology coursework at the University of Nevada Las Vegas, and became Fire Management Officer at San Carlos in 2009.

When Ecology, Management, and Culture Align

Oral Presentation

In the last 10 years, fire regimes in frequent-fire ecosystems on the San Carlos Apache Reservation have begun to change significantly. The intent to reestablish historical fire regimes to the extent possible is part of a broader recognition by Apache elders of a need to improve the health of the natural world. Although Native Americans of the White Mountain/Gila River region have been leaders in the use of modern prescribed fire since the mid-twentieth century, patterns of landscape-level wildfire at San Carlos have until recently been controlled by protection-oriented fire management. Reducing catastrophic wildfire risk to the working forests at San Carlos has long been a priority of the Forest Management Program. About ten years ago, the direction of the fuels management program expanded from protection of timber resources and WUI areas to include landscape-scale prescribed fire for both hazardous fuels reduction and ecosystem restoration. Fuels management began to provide anchor points on the landscape, and since 2009 increasing use of other-than-full-suppression strategies has resulted in a trend towards fire regime rehabilitation, and continues to provide a larger decision space for future management of wildfires.

Guyette, Richard

Richard Guyette, Professor, University of Missouri. He has been modeling fire and climate since 2006. Guyette, R.P., M.C. Stambaugh, J.M.. Marschall, E. Abadir. 2015. An analytical approach to climate dynamics of fire frequency in the Great Plains. Great Plains Research. Guyette, R.P., F.R. Thompson, J. Whitter, M.C. Stambaugh, and D.C. Dey. 2014. Future Fire Probability Modeling with Climate Change Data and Physical Chemistry. Forest Science. Guyette, R.P., M.C. Stambaugh, D.C. Dey, and R.M. Muzika. (2012). Estimating fire frequency with the chemistry of climate. Ecosystems 15: 322-335.

The direction, magnitude and theory of ecosystem fire probability as constrained by precipitation and temperature

Oral Presentation

Society is confronted with the effects of variable climate on wildland fire in many very different ecosystems. Precipitation and temperature affect the combustion dynamics of ecosystems through different chemical, physical, and biological paths. We use an ecosystem combustion equation developed with the physical chemistry of atmospheric variables to estimate and simulate fire probability with climate data and scenarios. The calibration of ecosystem fire probability with basic combustion chemistry and physics offers a quantitative method to address wild land fire probability in addition to well-studied forcing by topography, ignition, and vegetation. A diagrammatic mapping tool for estimating climate forced fire probability from temperature and precipitation illustrates ecosystem combustion theory and prediction. Climate affected fire probably for any period, past or future is estimated with given temperature and precipitation data (simulated or actual). A graphic analyses of wildland fire dynamics driven by climate supports a dialectic in hydrologic processes that affect ecosystem combustion: 1) the production of carbon bonds by plants (fuel) and 2) the inhibition of successful reactant collisions by H2O molecules (humidity and fuel moisture). These two postulates enable ecosystems to be classed into three or more climate categories using their position relative to 'switch over loci' (SWO Locus) defined by precipitation in combustion dynamics equations. Three coarse categories of ecosystem fire probability include: 1) precipitation insensitive, 2) precipitation unstable, and 3) precipitation sensitive. All three categories interact with variable levels of mean maximum temperature.

Embracing 'smart ignitions' in the combustion dynamics of ecosystems

Oral Presentation

The combustion dynamics of wildland fire are controlled by the physical chemistry of precipitation, temperature, oxygen, and activation energy in ecosystems. With the exception of activation energy these factors are governed by the reaction environment and reactants in an ecosystem. Wildland fires require 'rare' and focused activation energy to begin releasing carbon bond energies. The occurrence of exothermic reactions in ecosystems, although constrained by reactants and environment are greatly limited by activation energy. This rarity of focused activation energy in ecosystems is where the 'smart ignitions' of humans have evolved fire cultured landscapes. As we learn the significance of combustion dynamics in ecosystems the importance of 'smart ignitions' is opened in theory, models, and observations. The human ignition factor has increased and decreased fire frequency beyond the constraints of climate. Beyond climate, fire occurrence probabilities change with human migration and population, moisture and temperature regimes, and predictability. Here we show examples of the record of human ignitions in relation to the climate predicted fire record among the Passamaquoddy, Lakota Sioux, Ojibwe, and other peoples.

Haas, Jessica

Jessica R Haas is an ecologist with the Rocky Mountain Research Station. Her research focuses on the development of decision support tools for analyzing risk of various hazards to human communities and watersheds. Her work has been used by government, research and non-government organizations in a variety of wildfire and post-fire debris flow risk assessments, ranging from large national scale assessment, to local level project planning.

A framework and GIS tool for integrating White-headed woodpecker habitat models into Fire and Land Management Planning Scenarios

Poster Presentation

The White-headed woodpecker occupies a limited distribution in the Inland West and is reliant on a mosaic of open and closed canopy Ponderosa Pine forests. This woodpecker is considered a species of conservation concern by state and federal agencies in the Inland West because of habitat loss, primarily due to wildland fire suppression and logging. Additionally, white-headed woodpeckers have been used as a focal species for Effectiveness Monitoring of Collaborative Forest Landscape Restoration Projects, because their presence is a useful indicator of historic forest conditions described as restoration targets. Land management objectives for areas inhabited by this bird include restoration of historic range and variability of large diameter Ponderosa Pine forests. We demonstrate how a habitat suitability index (HSI) model can be integrated with landscape change models within a Geographic Information System (GIS) to simulate future forest conditions under various management strategies. These scenarios can include expanded beneficial wildland fire, prescribed burning and fuels reduction through selective harvesting, to name a few. The integration of these models can be used to compare the feasibility of alternative strategies for achieving the goal of restoring historic forest conditions and improving habitat suitability for White-headed Woodpeckers in forests.

Investigating temporal trends in wildfire hazard

Poster Presentation

Large scale disturbances alter the likelihood and intensity of wildland fires. These changes in wildfire hazard in turn alter the risk profile of a given area. While many wildfire risk assessments have focused on a snapshot of current wildfire risk across a landscape, none have looked at the temporal changes in risk through time. As a necessary first step in quantifying temporal changes in risk, the changes in wildfire hazard must be identified. I use a time series of landscape level fuel characteristics from 2000 – 2012 to investigate changes in wildfire hazard for the Southern Rocky Mountains in Colorado. This area has seen multiple large scale disturbances in this time period including prolonged drought, extensive insect related tree die-off and large wildland fires. By comparing estimates of wildfire likelihood and intensity across the time series, the temporal trends in the hazard profile is obtained and the drivers of this change can be identified. This information is critical for assessing expected future changes in wildfire hazard due to large scale disturbances such as climate change.

Haire, Sandra

Sandra Haire, Ph.D., is a Research Landscape Ecologist and sole proprietor of a small business, the Haire Laboratory for Landscape Ecology. Her work with Dr. Kevin McGarigal on tree regeneration and plant community distributions following severe fire made an important contribution to a growing body of work focused on ecological functions of burn heterogeneity. She continues to pursue this focus in recent projects aimed at understanding how fire generates refuges, or safe havens for species and communities under climate change.

Landscape characteristics of forest refuges in northern New Mexico following multiple fire events

Poster Presentation

Unburned patches within the perimeter of large fire events can serve as refuges for biological legacies, enabling post-fire regeneration and recovery of the surrounding landscape. Recent large, high-severity fires such as the 63,000-ha Las Conchas fire in 2011 have elevated interest in fire refuges. Using plant species cover data collected in 2013-2014 within the Las Conchas burn perimeter, we sought to identify where such refuges occur, explore whether they persisted through multiple fires, and understand what plant species they protect. To identify refuges, we classified a Landsat change detection image (ΔNBR; 1 = refuge, 0 = non-refuge), and then used a kernel estimator to convert the classified image to a continuous surface. Refuges ranged in size, shape, and core area, and were associated with particular physiographic settings known to afford protection from fire spread. Larger refuges were associated with areas that had previously burned at low severity in the past. Plant communities varied systematically across the continuous kernel-refuge surface; trees, including ponderosa pine (Pinus ponderosa), occurred mainly in larger refuges. Information on the spatial pattern and conservation value of refuges can aid managers in identifying and maintaining these places through changing climate and fire regimes.

Halbrook, Jeff

Jeff Halbrook is a Ph.D. Student with the Department of Forest Engineering, Resources and Management in the College of Forestry at Oregon State University. He has held various research positions with the University of Idaho, University of Montana-Missoula, and the USDA Forest Service. His interests include fuels reduction, harvest operations, and timber sale appraisal.

Mastication: An alternative to grapple piling and burning activity fuels

Oral Presentation

During the fall of 2005, a study was conducted at Priest River Experimental Forest (PREF) in northern Idaho to investigate the cost of mastication alone as opposed to a different treatment option involving hand thinning, grapple piling, and pile burning; both options were designed to treat activity and standing live fuels. In the first study, a rotary-head masticator was used to crush and chop activity fuels within 19 commercial thinning units comprising 37.07 acres total. As a comparison, slash was hand cut, grapple piled, and burned on an additional 45.51 harvested acres. Under similar forest conditions, the masticator treated at an average rate of 0.57 acres/hour compared to 0.25 acres/hour for slashing with grapple pile and burn. As a result, it was less expensive to masticate the slash at $588 per acre than slash, grapple pile, and burn the piles at $760 per acre. In addition, mastication treated the activity and standing live fuels in one step. The tradeoff, however, was that mastication increased the fine fuels thus increasing the fire hazard in the short term. Both treatments showed that stand and site characteristics such as slope, residual tree density, and total acreage could significantly affect the time and cost required to treat these areas.

Hall, Wesley

Wesley A Hall the Forest Fire Fuels Planner on the Coconino NF. Education was received via Master's Degree from Northern Arizona University in Forest. Employment with the Forest Service requires completion of all Forest level analysis, assessment and reporting. Assessments have been made on multiple vegetation types and fire regimes.

Fuels Treatment Effectiveness and Utilization in Suppression: A case study of the 2014 Slide Fire on the Coconino National Forest

Oral Presentation

The Slide fire began on May 20th, 2014. Fueled by high winds, the fire quickly grew to over 30 acres triggering immediate evacuations of the communities in Oak Creek Canyon north of Slide Rock State Park. The observed fire behavior during the first two operational periods was very active. Initial attack resources report rates of spread estimated to be excess of 2-4 miles per hour during the first operational period with 1-2 mile spotting. The fire burned through a portion of 3 separate strategically placed NEPA projects, as well as, several older timber sales and past wildfires. These "treatments" helped turn the page from a very high intensity fast moving wildfire, to one of low to moderate intensity that fire fighters could use to contain the fire with no major injuries or structures lost. One of these treatments was strategically placed north of Oak Creek Canyon where an estimated 300+ spot fires crossed the control line. These spot fires were quickly extinguished helping to protect the City of Flagstaff and surrounding communities that were in the fires path. The fire was contained at 21,227 acres with only 15% of the burn under high severity.

Hallema, Dennis

Dennis Hallema is a research hydrologist and fellow of the Oak Ridge Institute for Science and Education based at USDA Forest Service Southern Research Station in Raleigh, North Carolina. As part of the national Joint Fire Science Program, Dennis aims to establish long-term effects of large wildfires on water supply across the contiguous United States, and identify municipal watersheds that are most vulnerable to wildfires. Dennis, who holds B.Sc. and M.Sc. degrees in Geosciences from Utrecht University (the Netherlands) and Ph.D. in Continental Waters and Society from Montpellier SupAgro/INRA (France), was recently interviewed on this topic by CBC Radio Canada.

Discussion of short and long term hydrologic effects of wildfire and associated management strategies in forests of the contiguous United States

Oral Presentation

Increasing trends in fire activity associated with climate change and forest densification, particularly in the western United States, increase the need for understanding fire impacts on the hydrology of forest ecosystems. This is all the more true considering the fact that approximately half of the nation's fresh water resources originate on forest lands. We here provide an overview of known hydrologic effects of wildfire and related forest management strategies across the contiguous U.S. (CONUS) and fill in the gaps in the current knowledge. Canopy loss results in soil surface sealing and accelerated post-fire runoff, while tree reduction (thinning and prescribed burning) potentially increases runoff during a short period by reducing transpiration. An ash layer on the other hand may increase surface water storage. By comparing the multi-year measured data for hydrologic response to wildfire with simulations in the Water Supply Stress Index (WaSSI) model, we demonstrated that depending on topography, species composition and fire history, post-fire stream flow was higher than predicted in 15 CONUS watersheds, lower in 9 watersheds, and unchanged in 12 watersheds ($p<0.05$). This approach will allow us to identify watersheds that are most vulnerable to wildfire impacts.

Hallgren, Stephen

Steve Hallgren, Assoc. Prof. Forest Ecology, Oklahoma State University, conducts research and instruction in forest ecology and wildland fire ecology and management in the Department of Natural Resource Ecology and Management. His recent research and publications concern prescribed burning effects on species richness and composition and ecosystem function in the Cross Timbers forests of south-central United States.

Improving management of wildlife parks in West Africa through better understanding of the interactions among fire, vegetation and elephants: A research proposal

Oral Presentation

In spite of its immense importance for ecosystems, economies and cultures, the African elephant (Loxodonta africana) is under extreme threat from poaching and loss of habitat. It is largely restricted to wildlife parks where it can be protected and its habitat managed through the use of prescribed burning. The dramatic effects of prescribed burning on vegetation determine the health and movements of elephants and can keep them from leaving the parks to feed in nearby farms. Information about effects of prescribed fire on vegetation regrowth and elephant behavior in West Africa is sometimes inconsistent and lacking detail. NDVI (Normalized Difference Vegetation Index) from satellite imagery will be used to model temporal patterns of regrowth of herbaceous and woody vegetation following prescribed burning according to season of the burn and rainfall patterns. Unmanned aerial vehicles will be used to track elephant use of recent burns to determine their response to prescribed burning. Research will be done at the large transnational W-Arly-Pendjari (WAP) park on the borders between Burkina Faso, Benin and Niger. The new information will be used to provide guidelines to wildlife park managers for prescribed burning to improve habitat and management of elephants in West Africa.

Hamby, Gregory

Greg Hamby is Graduate Research Assistant in the Department of Forestry at Mississippi State University. His M.S. thesis research focused on the long-term consequences of mechanical mastication fuels treatments on tree growth and mortality and post-treatment vegetation recovery. He has worked in fire and forest research for the USDA Forest Service and National Park Service.

Long-term ponderosa pine growth and mortality following mastication and prescribed fire in northern California, USA

Oral Presentation

Mastication is increasingly used as a fuels treatment in fire-prone forests and shrublands. Following mastication, considerable woody fuels remain that can result in high overstory tree mortality when burned, compromising treatment longevity. One option to reduce masticated fuels is prescribed fire, but questions remain regarding effects on tree survival and, when trees do survive, lasting effects on tree growth. We evaluated the effects of mastication and prescribed fire on ponderosa pine (Pinus ponderosa) in northern California. We compared quadratic mean diameter increment (QMDinc), changes in canopy base height, and total height across three treatments: mastication only; mastication followed by prescribed fire; and a control. To evaluate long-term effects on pine growth, we compared basal area increment of pines across crown scorch adjusted for initial dbh. Mastication significantly increased QMDinc relative to controls; QMDinc was unaffected by burning. Canopy base height and total height did not differ by treatment. Post-fire pine mortality was 8% and 38% at the two sites, with minimal additional mortality occurring after two years. Crown scorch had a significant effect on post-fire growth at one site where growth was greatest where scorch was low-moderate (25-35%). Results suggest substantial resilience of ponderosa pine to prescribed burning following mastication.

Hamilton, Robert

Bob Hamilton has worked for The Nature Conservancy since 1982 in various conservation and stewardship positions, starting in the Dakotas. Since 1988 he has been in Oklahoma, and is the Director of the 16,100 ha Tallgrass Prairie Preserve. He directs all aspects of the Preserve's land protection and conservation programs, with special focus on management of the Preserve's 2,700 bison, leading the prescribed burn program (682 burns on 138,000 ha to date), and research partnerships. In addition, Bob serves as the TNC's Fire Manager for Oklahoma and Kansas, and is involved in TNC's regional conservation planning and outreach.

Ecological Restoration and Conservation Outreach in the Tallgrass Prairie of Oklahoma

Oral Presentation

The 1.5M ha Flint Hills of Oklahoma and Kansas comprise the largest tallgrass prairie landscape in North America. Fire is regularly applied by ranch managers across a sizable portion of this privately-owned landscape. Grazing regimens typically stress uniformity which combined with high fire frequency result in a largely homogeneous landscape with lowered biodiversity potential. Increasing landscape heterogeneity is a goal of The Nature Conservancy (TNC) in the Flint Hills. At TNC's 16,100 ha Tallgrass Prairie Preserve in northeastern Oklahoma, a free-ranging herd of 2,700 bison on 9,600 ha interacts with randomly selected burn patches that approximate the historic seasonality and frequency of fire. The fire-bison interaction produces a vegetative structural and compositional heterogeneity in an ever-shifting landscape patch mosaic. An additional conservation strategy has been the development of "patch-burn grazing" regimes that promote heterogeneity using cattle. Since 2001, seven pastures totaling 4,600 ha have been dedicated to this applied research and demonstration effort with Oklahoma State University. Results have been encouraging: heterogeneity and biodiversity can be enhanced with little or no decrease in livestock production. Additional strategies will also be presented that are being utilized to promote heterogeneity-focused range management practices on private rangelands in the Flint Hills.

Hamilton, Dale

Dale Hamilton has been an Assistant Professor of Computer Science at Northwest Nazarene University since 2013. In addition to teaching a variety of Computer Science courses, Dale is the Primary Investigator on NNU's NASA funded FireMAP project, utilizing machine learning and unmanned aerial system (UAS) to map wildland fire extent and severity, research included in his studies as a PhD student in Computer Science at the University of Idaho. Since coming to NNU, Dale has continued his long standing relationship with the Wildland Fire Management Research Development and Application (WFRD&A), guiding the development of wildland fire related decision support tools.

Fire Monitoring and Assessment Platform (FireMAP): A More Responsive, Affordable and Safe Method for Mapping Wildland Fires.

Poster Presentation

Most wildlands have evolved with fire and depend on periodic blazes for health and regeneration. The Fire Monitoring and Assessment Platform (FireMAP) provides a responsive, affordable and safe capability to monitor the severity of wildland fires. FireMAP is composed of unmanned aircraft systems (UAS) and software to process and geo-analyze imagery. After a fire has been extinguished, the UAS will fly over the affected area and acquire imagery, which will be georeferenced and mosaicked to create a composite image. The software then analyzes the imagery, identifying the extent and severity of the burn. The analysis of acquired imagery is a vital step in creating actionable knowledge. FireMAP utilizes machine learning classifiers to classify all of the pixels within an image as to whether they burned based on the pixels' electromagnetic signatures. Optionally, the classifiers may also classify unburned pixels by vegetation type. Utilization of imagery obtained via a UAS results in exorbitant amounts of data. We are developing a data repository and associated tools. This will assist with data management of UAS imagery providing tools which will allow users the ability to query resulting geospatial information.

Hamman, Sarah

Sarah Hamman is a Restoration Ecologist at the Center for Natural Lands Management in Olympia, Washington. Her work is focused on improving restoration methods for rare species habitat in Pacific Northwest prairies using rigorous science. She is especially interested in understanding how legacies of past land use influence current restoration success through altered soil functioning, plant communities, and fire regimes.

Maximizing benefits and minimizing risk to fire-sensitive species using prescribed fire

Oral Presentation

Prescribed fire is an essential management tool in prairie restoration, and rare species recovery often guides this management. It is important to understand how we can utilize fire to create and maintain rare species habitat, while limiting direct negative impacts to the organisms themselves. Intensive monitoring of vegetation, burn day weather, fire intensity and fire severity has increased our ability to understand how fire impacts the habitat of two fire-sensitive species: the Taylor's checkerspot butterfly and the Mazama pocket gopher. Key butterfly and gopher resource plants responded either neutrally or positively to burning, depending on fire severity and intensity. Average maximum belowground temperature at just 2cm depth, which is important for rare butterflies in diapause and fossorial mammals, measured across 6 prairie burns was below the documented butterfly mortality limit of 40°C. However, temperatures varied dramatically between and within burns, based on intensity and severity. Burning during different times of year, burning at different times of the day, and using multiple ignition patterns can influence fire intensity and severity. As we elucidate the linkages between burn day weather, fire severity, and fire effects, we can more effectively craft fire prescriptions to maximize habitat benefits and minimize risk to fire-sensitive species.

Hammond, Darcy

Darcy H. Hammond is a PhD student in the Department of Forest, Rangeland, and Fire Sciences in the College of Natural Resources at the University of Idaho. Her work examines burn severity effects on post-fire regeneration and reburn potential following large wildfires.

Contrasting sapling bark allocation of five southeastern USA hardwood tree species in a fire-prone ecosystem

Oral Presentation

A key aspect of tree post-fire survival is the rapid accumulation of protective bark within fire return intervals. We compared bark accumulation in saplings (4-5 years old) of five co-occurring hardwood species within a longleaf pine (Pinus palustris) ecosystem in northeastern Alabama. Sampled species were blackjack oak (Quercus marilandica), sand hickory (Carya pallida), common persimmon (Diospyros virginiana), rock chestnut oak (Quercus montana), and red maple (Acer rubrum). Using bark thickness and inside-bark wood diameter measurements taken at 20 cm intervals along the stem, we found significant differences between species in the ratio of bark to wood despite no significant species differences in wood diameter. Bark comprised over half (bark:wood = 0.55) of the basal diameter of blackjack oak, which was 3×, 4×, and 6× greater than the bark:wood ratio of sand hickory and rock chestnut oak, common persimmon, and red maple, respectively. Blackjack oak also allocated relatively more to bark at its base (in the flaming zone) and relatively less as height increased compared to other species. Red maple, a commonly cited ecosystem invader during fire-free intervals, invested the least in bark thickness. These results confirm the adaptive importance of bark thickness to enhancing species survival in frequent fire regimes.

Long-term burn severity and edge effects on conifer seedling survival following large widlfires

Student Poster Presentation

The effects of high burn severity patches on the recruitment and survival of conifer seedlings are of high research and management concern given projected increases in high severity fire. Long-term (>10 years post-fire) seedling studies are especially critical in elucidating potential recovery trajectories. Post-wildfire ponderosa pine (Pinus ponderosa) seedling densities, collected 2015, from the Hayman (Colorado 2002) and Jasper (South Dakota 2000) fires were examined. Seedling densities in high and moderate severity patches at Hayman show no apparent pattern of edge effects; likely because ponderosa seedling recruitment was universally very low (average 81 [SD±220] stems/ha in high/moderate severity vs 514 [SD±961] stems/ha in low/unburned patches). Jasper, however, exhibits a pattern of increased seedling density in high/moderate severity areas located less than 90 m from an unburned patch, although a similar pattern of decreased seedling densities is observed in high and moderate burn severity patches as a whole (850 [SD±1688] stems/ha in high/moderate vs 3805 [SD±6111] stems/ha in low/unburned). This data highlights the location specific nature of seedling regeneration patterns and the need for further investigation into the drivers of post-fire seedling success, particularly in areas such as the Hayman Fire where natural post-fire regeneration may not be meeting management objectives.

Hanes, Chelene

Chelene Hanes is a Physical Scientist with Natural Resources Canada located at the Canadian Forest Service laboratory in Sault Ste. Marie, Ontario, Canada. Her research interests include fuel moisture, fire danger rating and fire behaviour. Current areas of research include using remote sensing and spatial analysis techniques to improve fuel moisture estimates. She is also involved in research to support the Next Generation of the Canadian Forest Fire Danger Rating System.

Using the Canadian Precipitation Analysis (CaPA) to improve fire danger prediction.

Oral Presentation

The Canadian Forest Fire Danger Rating System (CFFDRS) is a national, modular system for rating fire danger. The Fire Weather Index System is a sub-system of the CFFDRS that provides numerical ratings of relative fire potential by tracking daily moisture exchange in the forest floor. The calculated indices are used operationally to estimate probability of ignition, difficulty of suppression and to some extent potential spread rates. The System is driven by changes in temperature, precipitation, relative humidity and wind speed, the accuracy of which ultimately influences the daily fire outlook. Environment Canada has recently developed the Canadian Precipitation Analysis (CaPA), a gridded precipitation product that integrates forecast data, station observations and Doppler radar coverage at a 10km scale for North America. The objective of this study is to show the validity of CaPA in improving the accuracy of spatial precipitation estimates and ultimately more accurate fire danger through improved estimates of fuel moisture. The analysis was done using a generalized cross validation procedure with fire weather station data for the province of Ontario for 2014 and 2015 fire seasons. These advancements may have significant impacts to fire danger prediction across Canada.

Hankins, Don

Don Hankins is a Professor of Geography and Planning at California State University, Chico. His interests and expertise is in the following areas: pyrogeography, ecohydrology, landscape ecology, conservation, environmental policy and Indigenous stewardship. Don has been involved in various aspects of environmental planning, stewardship, conservation, and regulation for a variety of organizations and agencies including federal and tribal governments. Drawing from his academic and cultural knowledge he is particularly interested in the application of Indigenous traditional knowledge as a keystone process to aid in conservation and stewardship of ecological and cultural attributes. He is also interested in policy to facilitate and protect this right of stewardship. He has published several articles specific to Indigenous prescribed fire and the social dynamics of colonization on cultural burning. Amongst other projects his current research includes longitudinal studies of fire effects on biodiversity, cultural resources and hydrology and overall environmental resiliency in riparian forests, oak woodlands, and meadows in California and Eucalypt and tea tree woodlands in the Cape York Peninsula, Australia. These projects involve working with local Indigenous communities in the respective areas in order to achieve a broader framework of collaborative stewardship and learning.

Restoring Indigenous Prescribed Fires to California Oak Woodlands

Oral Presentation

It is recognized that California Indians have stewarded the landscape for millennia. As such the coupling of fire and culture are interrelated and interdependent in many California ecosystems including oak woodlands. Colonization and subsequent governmental fire policy mandates have disrupted the cultural use of fire, which in turn has disrupted ecological functions where those fires are absent. As society grapples with the devastating impacts of wildfires and the loss of biological diversity, many Indigenous people see traditional fire use as a key to mitigation of devastating losses while retaining traditional livelihoods associated with burning. Indigenous burning in California is a keystone process, which creates heterogeneity of species and habitats while also promoting many culturally significant foods, materials and other resources of value to Indigenous communities and society. This research focuses on the restoration of Indigenous burning to blue and valley oak woodlands and the ecological and cultural effects thereof. Preliminary findings and community perspectives of this research will be discussed.

Hanson, Chad

Chad T. Hanson and Dominick A. DellaSala are ecologists with Earth Island Institute and the Geos Institute, respectively. They have authored dozens of scientific studies on topics as diverse as fire history, fire trends, wildlife species associated with post-fire habitat, effects of post-fire management, and post-fire natural succession. Drs. DellaSala and Hanson are also the editors of a landmark 2015 book, "The Ecological Importance of Mixed-Severity Fires: Nature's Phoenix", published by Elsevier.

Conservation Concerns Over Post-fire Management of Mixed-Severity Fire Areas

Oral Presentation

In many forested regions of the western United States, recent studies indicate an ongoing deficit of mixed-severity fire relative to natural, historical fire rates, causing a deficit of complex early seral forest (CESF) habitat. CESF is even rarer than old-growth forest in most regions, and supports levels of native biodiversity and wildlife abundance that meet or exceed those found in old-growth forest. Few or no protections for CESF exist on private or public lands, making it perhaps the most threatened forest habitat type in western North America. Extensive post-fire management projects invariably follow mixed-severity fires, including post-fire logging, removal of native shrubs (through mechanical means or herbicides), and tree plantation establishment, exacerbating the ongoing deficit of CESF. Currently, most wildlife species closely associated with snags (standing fire-killed trees) or shrubs (montane chaparral) in CESF have now become very rare and/or are declining. Meanwhile, reasons typically given for post-fire management, such as assumptions about fuel reduction or lack of natural conifer regeneration within larger high-severity fire patches, increasingly are at odds with current science. This oral presentation will cover emerging science, present key case studies, discuss evidence from a landmark new book, and recommend a path forward to conserve CESF.

Hanson, Thomas

Thomas E. Hanson is doctoral student at University of Colorado Boulder in the Department of Anthropology, and a National Science Foundation Graduate Research Fellow. He received a BS in anthropology and geography with minors in natural resource biology and industrial technology from Central Michigan University and an MA focusing on environmental anthropology from University of Texas at San Antonio. His mixed methods dissertation is titled: Fire, Community, and Ecological Change: A Diachronic Analysis of Anthropogenic Fire Disturbances, Risk, and Cultural Impacts in Southeastern Bolivia.

Dynamic Entanglements on the Fringe: Fire, Community, and Ecological Change in Lowland Bolivia

Oral Presentation

The Bolivian Chiquitanía is among the growing landscapes of fire with conflicting local, non-local, and state understandings of risk, vulnerability, the place of fire culturally and ecologically. Forest and range fires in southeastern Bolivia's Chiquitanía region have been growing in size, complexity, and severity. Within the region, the increasing formalization of fire suppression and prevention in fire management is occurring at the community level while simultaneously being supported through national and global climate change dialogues. Fire use in the Chiquitanía is essential to livelihood production and land management strategies while simultaneously construed as an ecological and social threat. Through a mixed methods approach this paper examines the liminal space that fire represents between the utilitarian and the disastrous amid shifting fire regimes, fire policy, and adaptive fire management in Bolivia's "21st century socialism".

Hargrove, William

Bill Hargrove received an M.S. in Entomology from University of Georgia in 1983, and a Ph.D. in Ecology from University of Georgia in 1988. He moved to Oak Ridge National Laboratory in 1990, and joined the ORNL staff in 2000. He joined the Forest Service in October 2006, as part of the Eastern Forest Environmental Threat Assessment Center at the Southern Research Station in Asheville, NC. At EFETAC, he works on ForWarn, a satellite-based forest disturbance monitoring system for the conterminous United States that delivers new forest change products every eight days.

An Empirically Derived National Map of Relative Wildfire Probability Rankings

Oral Presentation

We compared historical wildfire occurrence in the conterminous US with maps of phenologically-derived ecoregions, or phenoregions, and of wildfire biophysical settings regions. Multivariate clustering was used to group 12-year MODIS NDVI observed every 8 days into the 1000 most different phenoregions, based on the similarity of their annual NDVI profiles. A "label-stealing" technique captured vegetation type descriptions for each phenoregion from the best-fitting polygon in a library of vegetation-type maps. Similarly, a set of 3000 wildfire-relevant biophysical regions was statistically delineated on the basis of 36 biophysical burning characteristics obtained from remote sensing data. The phenoregion map implicitly considers climate, elevation, vegetation,and fuel type, while the biophysical settings map captures predominant abiotic burning conditions. Counts of number of wildfire events and areas burned within each region were summed, and regions within each map were ranked nationally. Ranks of regions were compared across each map, and with fire probabilities calculated independently by the process-based FSim model. This regional approach is useful for spatially extending past wildfire occurrences to areas having similar fuel and burning conditions. This simple empirical data-mining approach produces independent, hypothesis-free alternative national fire probability maps that can be compared to simulation modeling approaches and other more labor-intensive efforts.

Harling, Will

Will Harling has been shaped by fire in the Klamath Mountains his entire life. His first memory is of the 1977 Hog Fire that burned down to the back porch of the cabin he was born in when he was three years old. Wildfires have since come with a frequency and intensity that he has dedicated his life to restoring historic fire regimes as a way to protect his community and mountains and rivers that surround it. A recent cover story in Wildfire Magazine documents the compelling story of the Fall 2014 Klamath River Prescribed Fire Training Exchange, and how locals and tribal members are reclaiming the right to use fire as a tool to restore community and ecological resiliency.

Bringing Good Fire Back to the Klamath Mountains: The Western Klamath Restoration Partnership and the Klamath River Prescribed Fire Training Exchange (TREX)

Oral Presentation

A compelling story is emerging from the Western Klamath Mountains where diverse partners are working together to bring intentional fire back to a landscape that hasn't seen so little fire since the last Ice Age. Recent large scale wildfires have galvanized communities within the 1.2 million acre planning area of the Western Klamath Restoration Partnership simultaneously initiate large scale fire planning efforts, while creating a model to rapidly increase the use of prescribed fire as a tool in the Wildland Urban Interface through the Klamath River Prescribed Fire Training Exchange (TREX). The TREX brings together local, tribal, state and federal participants into a Type III Incident Management team to conduct highly technical burns directly adjacent to homes in on of the world's most complex fire environments. Together, these efforts hold the promise of restoring historic fire regimes and providing a model of how to not only live with fire, but use fire as a tool to protect and restore ecosystems, cultural resources, and threatened communities.

Harris, Lucas

Lucas Harris, PhD candidate in Geography, Penn State Lucas Harris is interested in the drivers of fire severity and how fire influences tree species abundances and distributions. He is presenting the results of his masters work, published in Ecosystems (Harris and Taylor 2015). Currently he is collaborating on extensions of his work in Yosemite as well as exploring topics related to fire and vegetation dynamics in the eastern Sierra Nevada for his PhD.

Topography, fuels and fire exclusion drive fire severity of the Rim Fire in an old-growth mixed-conifer forest, Yosemite National Park, USA

Oral Presentation

Fuel quantity, topography and weather during a burn control fire severity, but the relative contributions of these controls in mixed-severity fires in mountainous terrain are poorly understood. In 2013, the Rim Fire burned a previously studied 2125-ha area of mixed-conifer forest in Yosemite National Park. Data from 84 plots sampled in 2002 revealed increases in tree density and basal area and fuel buildup since 1899 due to fire exclusion. A dendroecological fire history and reconstruction of forest structure in 1899 showed that the area historically experienced frequent, low-severity fire. In contrast to the historical fire regime, burn severity for the Rim Fire interpreted from Landsat imagery showed that the area burned at mixed-severity. A random forest model was used to identify the controls of fire severity in the study area. Variables included were daily area burned, daily fire weather, and fuels and vegetation data. Topography, tree species abundance and forb and shrub cover best explained fire severity. As an example of a re-entry burn in an old-growth forest that had not burned for over a century, this study demonstrates that fire suppression related vegetation changes led to a mixed-severity fire in an area that historically burned at low severity.

Hart, Benjamin

Benjamin Hart is a Graduate Research Assistant at Oregon State University in Corvallis, OR. As a master's student, his research focuses on the impact of forest fuel reduction treatments (prescribed fire and mechanical thinning) on the symbiotic fungi of ponderosa pine (Pinus ponderosa).

Fire in the Future, Lessons from the Past: Forest fire fuel reduction treatment impacts on ponderosa pine mycorrhizal fungi diversity

Oral Presentation

Severe wildfires are an increasing risk as the western United States becomes hotter and dryer for longer periods annually due to the changing climate. Reduction of historically uncharacteristic woody fuels that drive large, severe forest fires is an increasing priority for forest managers. Traditionally, fuel reduction has been achieved with mechanized thinning for removing over-crowded trees and low-intensity prescribed fire to reduce woody fuels near the forest floor. However, the long-term impact of these fuel reduction treatments is poorly understood with respect to ectomycorrhizal fungi (EMF). We quantified EMF biodiversity associated with ponderosa pine (Pinus ponderosa) in four randomly assigned replications of restoration treatments (thinned, burned, thinned and burned, and untreated), applied over a decade ago. Preliminary results indicate that species richness was similar across treatment types and among sample units, and that fire effects on community composition was smaller than anticipated. Our results provide evidence that a 10+ year interval allows EMF to disseminate and re-colonize areas from which they have been removed or reduced by disturbance treatments. Knowledge of the long-term impacts of forest restoration treatments on EMF will aid in understanding the outcomes of management designed to produce stands with large-tree retention and low fuel loads.

Fire in the Future, Lessons from the Past: Perspectives from Forest Fire Reduction Treatment Impacts on Ectomycorrhiza Diversity

Poster Presentation

Severe wildfires are an increasing risk as the western United States becomes hotter and dryer for longer periods annually due to the changing climate. Reduction of historically uncharacteristic woody fuels that drive large, severe forest fires is an increasing priority for forest managers. Traditionally, fuel reduction has been achieved with mechanized thinning for removing over-crowded trees and low-intensity prescribed fire to reduce woody fuels near the forest floor. However, the long-term impact of these fuel reduction treatments is poorly understood with respect to ectomycorrhizal fungi (EMF). We quantified EMF biodiversity associated with ponderosa pine (Pinus ponderosa) in four randomly assigned replications of restoration treatments (thinned, burned, thinned and burned, and untreated), applied over a decade ago. Preliminary results indicate that species richness was similar across treatment types and among sample units, and that fire effects on community composition as was smaller than anticipated. Our results provide evidence that a 10+ year interval allows EMF to disseminate and re-colonize areas from which they have been removed or reduced by disturbance treatments. Knowledge of the long-term impacts of forest restoration treatments on EMF will aid in understanding the outcomes of management designed to produce stands with large-tree retention and low fuel loads.

Harvey, Brian

Brian J. Harvey is a David H. Smith Postdoctoral Research Fellow in the Department of Geography at the University of Colorado – Boulder. His research focuses on forest disturbance ecology at spatial scales ranging from individual trees to landscapes and regions. Topically, his research asks questions to better understand the causes and consequences of natural disturbances (e.g., fire, insect outbreaks, drought), and how disturbances interact to shape forest ecosystems.

Burn me twice, shame on who? Testing feedbacks among multiple wildfires and identifying factors leading to two successive stand-replacing fires

Oral Presentation

For many forested regions, a major consequence of climate-induced increases in wildfire activity is shortened intervals between fires. Continued warming and drying in upper montane and subalpine forests of the US Northern Rockies could decrease fire-free periods from intervals of >150 years (historically) to ~ 30 years by the mid-21st century. If a second stand-replacing fire occurs before the trees regenerating from the first fire reach reproductive maturity, transitions from forest to non-forest are likely. However, factors that contribute to severe, short-interval "reburns" in the Northern Rockies are unknown. In this study, I used a field-validated satellite burn severity index to test whether successive forest fires in the US Northern Rockies interact through feedbacks, and identified factors that are more likely to lead to two successive high-severity (stand-replacing) fires. Feedbacks among wildfires depended on forest type and interval between the first and second fire. Feedbacks in wildfire severity shifted from negative to positive with increasing elevation and with interval between two fires. Areas characterized by two successive stand-replacing fires were in subalpine forests at higher elevations, shallower slopes, and northeasterly aspects where the interval between fires was longer. Findings can help target areas most at risk from altered fire regimes.

Forest structure, wildfire severity, and postfire resilience following recent bark beetle outbreaks in the US Northern Rockies

Oral Presentation

Native bark beetles caused extensive tree mortality throughout western North America over the last several decades, leaving questions about whether post-outbreak forests burn with higher severity and/or exhibit lower postfire resilience than forests unaffected by outbreaks. Here we synthesize research conducted across the US Northern Rockies in lodgepole pine forests affected by mountain pine beetle and Douglas-fir forests affected by Douglas-fir beetle. We examine changes to forest structure, fuels, subsequent fire severity, and early postfire tree regeneration in forests impacted by recent beetle outbreaks. Up to 90% of tree basal area was killed in severe outbreaks, however post-outbreak stands contained more live than dead trees. Outbreaks generally decreased canopy fuels and increased surface fuels; effects were weaker in Douglas-fir forests. Prefire outbreaks had minor effects on subsequent fire severity; when present, effects differed by forest type, time since outbreak, and weather conditions when stands burned. Fire severity was driven primarily by weather and topography, regardless of prefire outbreaks. Postfire tree regeneration was unrelated to prefire outbreaks for serotinous lodgepole pine forests, but was reduced in Douglas-fir forests. Existing studies reveal surprisingly minor effects of beetle outbreaks on the subsequent ecological impacts of wildfire, and highlight important differences among forest types.

Haugo, Ryan

Ryan Haugo, Senior Forest Ecologist, The Nature Conservancy. Ryan was the lead conservation scientist for the Conservancy's recent acquisition of nearly 20,000 hectares of former Plum Creek timberlands in central Cascades of Washington State.

Applying the principles of landscape restoration within the central Washington Cascades: The Manastash-Taneum Large Landscape Project

Oral Presentation

Extensive efforts are being made across North America to restore the ecological patterns and processes of historically fire-dependent forested ecosystems. However, there is a growing recognition that a simple focus on stand-level forest management and uncoordinated terrestrial and aquatic restoration efforts will not lead to resilient ecosystems capable of continuing to provide critical habitat and ecosystem services in the face of a warming climate. The need for a landscape scale approach was recently crystalized in Hessburg et al.'s (2015) Restoring fire-prone landscapes: seven core principles. Here we describe the analytical foundation for applying these core principles within the Manatash-Taneum Large Landscape Restoration Project area. The project encompasses ~40,000 ha in the central Washington Cascades with a mix of federal, state, and private ownership, and is focused on 1) improving watershed conditions and processes, 2) restoring aquatic habitats to support recovery of listed fish, 3) restoring patterns of vegetation and habitat successional patches, and 4) restoring inherent fire/disturbance regimes. Following the core principles, we have produced comprehensive "landscape prescriptions" using historical and future climate change analogue reference conditions, which provide the basis for land managers to effectively work across ownership boundaries while respecting individual landowner objectives.

Hawbaker, Todd

Todd Hawbaker is a research ecologist with the US Geological Survey in Denver. He leads development of the Burned Area Landsat Science Product, an automated approach to identifying burned areas in temporally-dense stacks of Landsat imagery.

Automated mapping of burned areas in Landsat imagery; tracking spatial and temporal patterns of burned areas in the southwestern United States

Oral Presentation

The United States Geological Survey (USGS) is the steward of the Landsat archive which includes satellite imagery dating back to 1972. The United Nations Framework Convention on Climate Change and the Intergovernmental Panel on Climate Change have specified requirements to systematically observe atmosphere, ocean, and land characteristics, or Essential Climate Variables (ECVs). The Global Climate Observing System has developed formal specifications for ECVs that are technically and economically feasible for systematic ECV observation. Fire Disturbance, specifically burned area, is one of the 14 Terrestrial ECVs. Landsat's temporal resolution and sensor characteristics make it more suitable for mapping burned area than existing burned area products from coarse resolution sensors. We have developed an automated algorithm to identify burned areas in temporally-rich stacks of Landsat surface reflectance data using boosted regression trees and spatial filters scenes using training data derived from the Monitoring Trends in Burn Severity database. For this presentation, we present results from our burned area mapping algorithm for the southwestern United States and quantify how relationships between burned areas and sea-surface temperature indices (e.g. el Niño) vary among different land ownership categories in different ecoregions.

Hays, Quentin

Quentin Hays is an Assistant Professor of Natural Resources at Eastern New Mexico University in Ruidoso, and the current Chair of Mathematics and Sciences. He is a wildlife biologist by trade and training, and current President of the New Mexico Chapter of The Wildlife Society. In 2012 he received a Collaborative Forest Restoration Program grant to evaluate impacts of forest treatments on Mexican spotted owls in the Sacramento Mountains of New Mexico. Quentin received the Wings Across The Americas award for Bat Conservation from the USDA Forest Service in 2011. He lives in Ruidoso, NM with his wife and daughters.

Continued Use of a Post-fire Landscape by Mexican Spotted Owls in New Mexico

Poster Presentation

High-severity wildfire is considered one of the largest threats to persistence of Mexican spotted owls (Strix occidentalis lucida), though evidence exists that spotted owls utilize post-fire habitat in the Southwest and elsewhere. Whether continued use occurs due to habitat suitability or because of the known high site fidelity of this species remains unclear. The Little Bear Fire burned 44,380 acres during June 2012; impacts to owl habitat ranged from low-moderate-high severity mosaics to complete high-severity burnover, with 16 of 23 protected activity centers (PACs) effected. During the nesting seasons of 2013, 2014 and 2015, successful MSO reproduction occurred in multiple impacted PACs, including in areas classified as high-severity. Owls utilized burned snags as nest trees and successfully fledged multiple young in post-fire habitat each year. Changes to basal area and canopy cover in impacted PACs are severe, and are known to be important factors in MSO site selection. However, these appear to be outweighed by a presumed increase in prey abundance, or by other factors. Continued monitoring is warranted, but it is possible that stand-replacement wildfire may not be as large a threat to MSO persistence as previously thought, at least in the short-term.

Helmbrecht, Don

Don is a Wildland Fire Analyst with the US Forest Service TEAMS Enterprise Unit. He has participated in over ten quantitative wildfire risk assessments and is a co-author of five publications on the topic.

Integrating analysis of ecological integrity with the wildfire risk assessment framework in the Southern Sierras

Oral Presentation

The fire regime condition class framework provides a methodology for assessing the ecological integrity of landscapes by comparing current-day vegetation structure to a natural range of variability (NRV) in vegetation structure. The wildfire risk assessment framework provides a methodology for evaluating the potential effect of wildfire on highly valued resources and assets. Our approach demonstrates a methodology for integrating these two frameworks to identify areas of the landscape where wildfire is likely to benefit ecological integrity by moving vegetation structure towards the NRV, or threaten ecological integrity by moving vegetation structure away from the NRV. Our analysis of ecological integrity showed 24% (1.2 million acres) of the area within forested biophysical settings with low departure from the NRV in vegetation structure; 73% (3.7 million acres) with moderate departure; and 3% (134,000 acres) with high departure. Through integration with the wildfire risk assessment framework we found that wildfire is likely to have a mean beneficial effect on ecological integrity for the majority of the area with low or moderate departure (84% and 86%, respectively)—the remaining area showed a mean negative effect. In areas of high departure, wildfire is likely to have a mean neutral (94%) or mean negative (6%) effect.

Herrera, Ruth

Ruth Herrera Student of Biology in UMSNH Studied Biology in the Universidad Michoacana de San Nicolás de Hidalgo. Her interests in geology began in her thesis, when using it as a tool to understand the past events, like fires. Now she is about to graduate and get her degree in Biology.

Past Fires Chronology in Angangueo, Michoacán, México.

Poster Presentation

Angangueo is a mining town of origin, located in the Eastern side of the State of Michoacán, in México, with different kinds of forest ecosystems that now happen to be affected by recurrent wildfires. One of the biggest issues when applying fire management programs is the lack of information about historic fire regimes, on which the programs are supported. From fluvial-lacustrine sediments deposited in San Pedro´s river embankment, it was made a past-fires chronology. The results obtained were joined to other past researches in the same area, with the purpose of broading the temporal-spatial resolution. Five ages were obtained, the oldest was 1351, and the most recent 1801. But two of the ages were considered like the same event, taking into account the mistake within the dates. The average of occurance of this disturbances was of 150 years, the mininum of 131 and the máximum of 159. The last record found (1801) matches temporarily with the discovery of the first mine in Angangueo (1792) and its subsequent rapid settlement. One of the main contributions of this research was to extend the temporal threshold of the fire record in this area, through stratigraphy.

Hessburg, Paul

Paul Hessburg is a Research Ecologist with the USDA-Forest Service, PNW Research Station. He is stationed in Wenatchee, WA, where he has lived and worked for the last 25 years. His research interests are the landscape and disturbance ecology of historical and contemporary western US forests, natural wildfire resilience mechanisms of western forests, and the ecology and sociology of landscape restoration. He has 36 years of professional forestry experience in the West, has authored and co-authored >160 research articles and book chapters, including a recently released Springer title on decision support modeling in natural resource management. Today he will be speaking to us about 7 core principles for restoring fire-prone landscapes in the Inland Pacific. The content for this talk was recently published in the journal Landscape Ecology.

Restoring fire-prone Inland Pacific landscapes: Seven core principles

Oral Presentation

More than a century of forest and fire management of Inland Pacific landscapes has transformed their successional and disturbance dynamics. Regional connectivity of many terrestrial and aquatic habitats is fragmented, flows of some ecological and physical processes have been altered in space and time, and the frequency, size and intensity of many disturbances that configure these habitats have been altered. Current efforts to address these impacts yield a small footprint in comparison to wildfires and insect outbreaks. Moreover, many current projects emphasize thinning and fuels reduction within individual forest stands, while overlooking large-scale habitat connectivity and disturbance flow issues. We provide a framework for landscape restoration, offering seven principles. We discuss their implication for management, and illustrate their application with examples. Historical forests were spatially heterogeneous at multiple scales. Heterogeneity was the result of variability and interactions among native ecological patterns and processes, including successional and disturbance processes regulated by climatic and topographic drivers. Native flora and fauna were adapted to these conditions, which conferred a measure of resilience to variability in climate and recurrent contagious disturbances. To restore key characteristics of this resilience to current landscapes, planning and management are needed at ecoregion, local landscape, successional patch, and tree neighborhood scales. Restoration that works effectively across ownerships and allocations will require active thinking about landscapes as socio-ecological systems that provide services to people within the finite capacities of ecosystems. We focus attention on landscape-level prescriptions as foundational to restoration planning and execution.

Heumann, Blane

Blane Heumann is a twenty-eight year veteran of wildland fire management. As a burn boss, he has supervised over 175 prescribed burns in forest and grassland ecosystems, mostly in the central and southeast United States. In addition to U.S. wildland fire, he has facilitated conservation planning and instructed wildland fire courses to government and private forestry in Africa, Latin America and the Caribbean.

Low-cost approach to fire danger ratings in tropical forest and grasslands

Oral Presentation

Meteorological conditions are the predominant way in which fire risk is assessed. Data is usually derived from weather stations, aggregated, and assessed using considerable computer and communications resources. And new technology to remote sense vegetation fuel moisture shows promise in assessing conditions where weather station data is sparse. For many people and organizations working with fire in remote tropical locations, access to real-time data and new technology can be problematic. Precipitation, temperature and relative humidity are driving factors causing variability in burning conditions in tropical fuels. A low-cost and practical approach to assessing local fire potential is presented using relatively simple weather instruments and lookup tables. Burn conditions predicted using these metrics are assessed against wildfire occurrence data for the 2010 wildfire season in Trinidad & Tobago.

Heward, Heather

Heather Heward is an instructor at the University of Idaho. She started her career in wildland fire in 2002 and completed 8 seasons of wildland fire suppression while finishing her Undergraduate and Masters Degrees at the University of Idaho focusing on wildland fire management. Her notable achievements include providing students with real-world applications to their education and providing them with the experiences they need to move forward with their individual career plans in the area of fire ecology and management.

Educating Fire Professionals through experiential and online education in fire ecology and management

Oral Presentation

Managing fire is increasingly complex and high stakes, calling for advanced professional skills developed through training, experience and education. Access to degree programs which integrate education and experience is critical for current and future fire managers, both in the on-campus and online environments. Assignments that create deliverables useful to fire managers can ensure that education has clear, practical applications: burn plans for local tribes and agencies; short and long-term fire behavior assessments for regional ranger districts; and even monitoring programs to assess vegetation response to salvage logging and burn severity. Students can be challenged to work in interdisciplinary groups to conduct interactive debates about an array of issues related to natural resources as well as specifically living with fire. Leadership and collaboration can be emphasized and evaluated, encouraging students to think independently and as a team. Finally, online classes provide graduate and undergraduate education to fire professionals from around the world, helping them meet the needs of their jobs and advance in their careers by drawing on science and experience. In this presentation, we use examples from the University of Idaho to demonstrate how the learning environment can meet the critical need for experiential learning in a higher education.

Hicke, Jeffrey

Jeffrey A. Hicke, Associate Professor, University of Idaho, studies bark beetle outbreaks: their extent, causes, and consequences.

Effects of Bark Beetle-Caused Tree Mortality on Subsequent Wildfire

Oral Presentation

Millions of trees have been killed by bark beetles in western North America in recent decades. The possible effects on wildfires have raised concerns by resource managers and the public. We reviewed and synthesized the published literature on modifications to fuel and fire characteristics following beetle-caused tree mortality and developed a conceptual framework describing expected changes. Differences in these responses occur for different characteristics and with time since disturbance. We also quantified the support (agreement of published studies) or lack thereof (disagreement or knowledge gaps) for this framework. Our conceptual framework is supported by the published literature for many conditions, although disagreement exists in several areas. Key disagreement or knowledge gaps occur in early postoutbreak stages and crown fire behavior responses.

Higuera, Philip

Philip Higuera is an Associate Professor in the Department of Ecosystem and Conservation Sciences and the University of Montana. He directs the PaleoEcology and Fire Ecology Lab and teaches undergraduate courses in fire ecology. His research focuses on understanding relationships and interactions among climate change, vegetation change, and fire regimes over time scales from decades to millennia. Most of his work has focused on arctic, boreal, and subalpine ecosystems, from Alaska to Tasmania, Australia.

Causes and ecosystem consequences of fire-regime variability from decades to millennia

Oral Presentation

Advances in paleoecology have greatly improved our understanding of the patterns and drivers of wildfire regimes, highlighting an overarching role of climate from centennial to millennial time scales. The inferred mechanisms involve direct links between climate and fuel moisture, and indirect links whereby climate influences fire regimes by altering vegetation and landscape flammability. This talk highlights these themes by drawing on recent paleoecological studies from Alaskan boreal and Rocky Mountain subalpine forests. In parallel to the development of fire history records, paleoecologists are increasingly studying the impacts of forest disturbances on biogeochemical processes. Fire effects on ecosystem pools and fluxes can be inferred across a range of time scales, including short-term impacts and potential feedbacks between disturbance and vegetation change and key ecosystem properties (e.g., C and N cycling). The second part of the talk presents recent and new work highlighting the biogeochemical impacts of wildfires and fire-regime variability, utilizing paleoecological proxies and ecosystem modeling. Work from Rocky Mountain subalpine forest highlights the relevance of centennial and millennial variability in fire activity for understanding modern biogeochemical states. The paleo record further suggests that incorporating this variability into ecosystem models is critical for accurately projecting ecosystem impacts of future fire regimes.

Hill, Kathryn

Kathryn Hill is currently a Master of Science student at the University of Washington's School of Environmental and Forest Sciences, working in Dr. Jon Bakker's Terrestrial Restoration Ecology Lab. With her work funded by a National Science Foundation Graduate Research Fellowship, she is studying the effects of prescribed fire weather and fuel conditions on soil temperatures, severity, and post-burn vegetation structure in Pacific Northwest prairies. Her undergraduate research, published in Restoration Ecology, used null models to test native-exotic plant richness ratios across different burn frequency treatments. Kathryn is also a trained FFT1 and has participated in over 100 prescribed fires.

Prescribed fire in grassland butterfly habitat: targeting weather and fuel conditions to reduce risk of mortality and enhance habitat heterogeneity

Oral Presentation

Prescribed burning is one of the primary tools for habitat restoration in the fire-adapted prairies of the Pacific Northwest. Concerns about detrimental effects of burning on butterfly populations, however, can inhibit implementation of treatments. Burning in cool and humid conditions is likely to produce low-severity patches and reduce soil temperatures, which can be critical to survival of butterfly larvae. With these burning conditions, a complementary objective of enhancing butterfly habitat heterogeneity might also be achieved. In this study, experimental plots were burned across a wide range of weather and fuel conditions. Subsurface soil temperatures were influenced by air temperature and dead fuel moisture. Post-burn species richness increased more when burns occurred in higher fuel moistures. Multivariate ordinations showed community shifts from perennials towards annuals, with larger shifts appearing when plots burned in low fuel moistures. More structural microclimates (vegetation height classes) were found in plots burned earlier in the summer burn season, while semivariogram analysis showed that spatial height structure increased in heterogeneity when burning in higher dead fuel moistures. This research provides regional recommendations for burning in sensitive habitat and contributes to a greater understanding of how fuel moisture during grassland burning affects the resulting fine-scale heterogeneity of vegetation.

Hoffman, Chad

Chad Hoffman is an assistant professor of fire science at Colorado State University. He has a Ph.D. in Forestry from the University of Idaho and B.S. and M.S. degrees from Northern Arizona University. His work focuses on understanding how fine-scale spatial patterns, nonlinear dynamics, scale-related feedback and thresholds influence fire behavior across spatial and temporal scales using a combination of field, laboratory and physics based modeling approaches.

Restoration and fire behavior in ponderosa pine dominated forests of the southern Rocky Mountains

Oral Presentation

Restoration projects including the use of mechanical methods are being implemented across large scales in fire-frequent forests to simultaneously modify forest structure complexity and reduce potential crown fire hazard. For example the Collaborative Forest Landscape Restoration Projects of the central and Southern Rockies aim to create stands with a horizontal mosaic of tree patches, individual trees, and openings, and with vertical complexity in tree heights across stands while reducing the fire hazard. However, to date there has been little assessment of the ability for treatments to simultaneously meet both spatial heterogeneity and fire hazard reduction objectives. To assess both objectives simultaneously we stem-mapped seven 4 ha restoration treatment units in across the Southern Rockies and Colorado Plateau and used a combination of spatial statistical analyses and a 3-dimensional physics based fire behavior modeling to evaluate changes in spatial structure and fire behavior pre- and post-treatment. Results suggest restoration treatments have a mixed effect on spatial complexity and generally reduced fire hazard metrics. We often observed that treatments did not change, or enhance, the horizontal spatial tree patterns occurring before entry, simplified vertical complexity and reduced the rate of spread, fire intensity and amount of canopy fuel consumption.

Hoffman, Forrest

Forrest M. Hoffman is a Senior Computational Climate Scientist at Oak Ridge National Laboratory with nearly 20 years of experience studying the global carbon cycle using high performance computing to solve interesting problems in ecology and terrestrial biogeochemistry.

Applying a Big Data Approach to Detecting Fire Disturbances and Recovery at a Continental Scale Using Satellite Remote Sensing

Oral Presentation

Fire is a major driver of ecosystem processes, playing a complex role in the diversity and productivity of Earth's forests. Satellite remote sensing has revolutionized continental-scale forest health monitoring and management. In this study, a large scale data analytics approach for change detection was applied to 14 years of NDVI from the MODIS sensors on two satellite platforms. Cluster analysis was used to derive annual maps of regions that exhibit similar phenological behavior in the conterminous United States. Such regions are called phenoregions, and every location within the U.S. occupies a single phenoregion each year. Areas that abruptly transition in a single year to a phenoregion with significantly reduced NDVI are likely to have experienced a major disturbance, like fire, insect outbreak, windthrow, or clearing. Fire perimeter data from MTBS was used to verify that a subset of such disturbances was caused by fire. These data were used to develop regional thresholds of fire occurrence and NDVI signatures for identifying potential fire disturbances not captured in MTBS and for future detection and attribution of fire disturbances from satellite remote sensing. Finally, statistics of fire size and severity across latitude and elevation and through time will also be presented.

Hood, Sharon

Sharon Hood is a post-doctoral researcher in the College of Forestry and Conservation at the University of Montana, where she earned her PhD in Organismal Biology and Ecology in 2014. Her research focuses on the ecological role of fire over in driving forest dynamics and fire-bark beetle disturbance interactions and addresses three broad questions: 1) what are the causes of postfire tree mortality?; 2) how do changes in fire regimes affect forest succession and resilience to climate change and future disturbance?; 3) what are the effects of fire on host tree susceptibility to bark beetle attack?

Unintended Ecological Consequences of Removing Fire from Fire-Dependent Forests

Oral Presentation

Historically, many forested ecosystems in the United States burned frequently, both from lightning- ignited fires and from Native American burning. Frequent fire maintained low fuel loadings and shaped forests dominated by tree species adapted to survive low-intensity, frequent fire. Today, fire frequency in many of these fire-dependent forests has been greatly reduced, leading to many unintended ecological effects. The most discussed consequence of fire suppression is the increase in fire behavior due increase in tree densities and fuel, but the effects of removing frequent fire are much more widespread than this. Without frequent, low-severity fire, forests are more susceptible to bark beetle outbreaks and at increased risk of drought-induced mortality and burning with atypically high severities. While mechanical treatments are vital to restoration efforts in some of these forests, they are not a substitute for fire itself. I will provide an overview of latest research on the unintended effects of removing fire from areas with frequent, low-severity fire regimes. This research clearly shows that a major paradigm shift is needed in which more fires are allowed to burn to promote long-term forest resilience to a multitude of threats.

Modeling post-fire mortality under a changing climate: ways to move forward

Oral Presentation

Forests provide critical ecosystem services including wildlife habitat, erosion control, and carbon sequestration. There is a growing realization that under current and projected climates forests are becoming increasingly vulnerable to disturbances, particularly wildfire. In spite of this realization, our understanding of how fire kills trees is surprisingly rudimentary. Especially lacking is an understanding of how pre- and post-fire climatic stress influences tree mortality directly and indirectly via interactions with insects and pathogens. What little work that has been done on the subjects shows a historically recent decoupling between fire intensity (energy release) and fire severity (tree mortality). This disconnect blurs our ability to accurately predict mortality from wildfire, which in turn limits application of appropriate management actions to increase forest resilience to wildfire and understand the consequences of tree death on ecological processes ranging from habitat alteration to global carbon cycles. This special session presents recent research on fire-induced tree mortality from around the world. In this concluding talk to the special session on fire-induced tree mortality, I will recap the day's session and discuss potential ways to pool efforts to advance our current understanding of predicting fire-caused tree mortality in a changing climate.

Lick Creek Demonstration-Research Forest: 25-year fire and cutting effects on vegetation and fuels

Poster Presentation

Knowledge of forest vegetation and fuel dynamics following restoration treatments is essential for managers to understand and prescribe treatments. However, studies of long-term treatment effects in ponderosa pine forests of the Northern Rockies are limited. We are renewing research at the Lick Creek Demonstration/Research Forest on the Bitterroot National Forest, Montana to assess 25-year-effects of burning and cutting restoration treatments in a ponderosa pine-dominated forest. In addition, this area has a photo-series dating from 1909. There are seven treatments: control, shelterwood, shelterwood+wet prescribed burn, shelterwood+dry prescribed burn, commercial thin, thin+Fall prescribed burn, and thin+Spring prescribed burn. Our study objectives are: (1) how have restoration burning and cutting treatments affected vegetation dynamics?; (2) how have restoration burning and cutting treatments affected fuel dynamics?, and (3) how have restoration burning and cutting treatments affected ponderosa pine forest resilience to drought, fire hazard, and mountain pine beetles? This remeasurement, which began in 2015, will provide many benefits on the long-term effects of fuel treatments, including: (1) complete 25-year (1991-2016) effects of seven silvicultural cutting and burning treatments on fuels and vegetation; (2) archived FFI database; (3) demonstration site; (4) photo-history of the effects of fire exclusion and restoration treatments from 1909   2016.

Hossack, Blake

Blake Hossack is a Research Zoologist for the US Geological Survey, stationed at the Aldo Leopold Wilderness Research Institute in Missoula, MT. His research is focused primarily on wetland and amphibian dynamics, disturbance ecology, and wildlife diseases.

Effects of wildfire on amphibians and their parasites: influences of burn severity, isolation, and management

Oral Presentation

Climate-driven increases in disturbance regimes will have broad impacts on aquatic and semi-aquatic communities. Several large wildfires in Glacier National Park, Montana, since 1988 provided opportunities to measure fire effects on amphibian populations, as well as infection by parasitic nematodes and the pathogenic chytrid fungus, Batrachochytrium dendrobatidis (Bd). In the near-term (≤ 3 yr), comparison of pre-and post-fire data revealed boreal toads (Anaxyrus boreas) rapidly colonized many burned wetlands, but no change by long-toed salamanders (Ambystoma macrodactylum) or Columbia spotted frogs (Rana luteiventris). Over longer periods (≥ 6 yr), however, occupancy of long-toed salamanders and Columbia spotted frogs declined in areas that burned most severely. Wildfire had greater negative effects on salamander populations that were isolated and in managed forests. Post-fire changes in host density and environmental conditions reduced abundance of parasitic nematodes in salamanders and reduced the probability that boreal toads were infected with Bd. Collectively, these results show effects of wildfire on amphibians depend upon burn severity, population isolation, and prior land use, but also that fire effects may not be evident for several years. Subsequent effects on the abundance of amphibian parasites illustrate how changes in disturbance regimes can affect communities across trophic levels.

Hovick, Torre

Torre is an assistant professor at North Dakota State University. His research investigates the roles of fire and grazing processes in managing vegetation structure and composition for wildlife and invertebrates. He is currently doing research examining different grazing practices effects on bees, birds, and butterflies. Torre got his PhD at Oklahoma State and his MS at Iowa State University.

Increasing Grassland Suitability for Prairie-Chickens through Restored Fire and Grazing Processes

Oral Presentation

Greater Prairie-Chickens (Tympanuchus cupido) have undergone dramatic population declines over recent decades and the mismanagement of fire regimes throughout much of their distribution has exacerbated these declines. We investigated Greater Prairie-Chicken habitat selection (thermal, lek, and nest) and survival in tallgrass prairie managed with interacting fire and grazing. We found that Greater Prairie-Chickens selected nest sites that are as much as 8° C cooler than the surrounding landscape when air temperatures are ≥ 38° C and nest sites are nearly 4° C cooler than the area within 2 m of nests. Greater Prairie-Chickens selected lek sites in areas with relatively higher elevation, reduced tree cover, and lower road density. Nest sites were in areas that maximized time post fire while minimizing tree cover and distance to lek sites. Finally, we found that nest survival was best explained by weather variability (expressed in our models as solar radiation) and vegetation height. Our findings illustrate the importance of restored patterns of fire and grazing disturbance processes to provide highly variable vegetation structure and limited tree cover required by Greater Prairie-Chickens throughout all the periods of their life cycle. Management that creates favorable vegetation structure will maximize the potential for reproductive success when weather conditions allow.

Howard, Stephen

Mr Howard, Geographer, USGS EROS Center. He has been working at USGS/EROS since 1985 using Remote Sensing and GIS technologies for land cover change studies. He has been working on the Monitoring Trends in Burn Severity project since its inception in 2006.

Current Status of the Monitoring Trends in Burn Severity Project

Oral Presentation

By 2013, the Monitoring Trends in Burn Severity (MTBS) project had completed the assessment of over 15400 large fires that occurred across the United States between 1984 and 2010. Since then MTBS has continued to map fires occurring after 2010 and additional historic fires (i.e. pre-2010) that were previously missed because of incomplete fire records or lack of suitable imagery (before Landsat data became freely available). By the end 2015 over 20,000 fires will have been assessed. Although the majority of burn perimeter and severity mapping protocols have remained consistent during the project's lifetime, the way in which MTBS gathers and maintains fire records and some mapping protocols have changed. This presentation will inform MTBS data users about MTBS's past and present fire occurrence record keeping and production protocols, the statistics of MTBS fires currently available in the archive (http://www.mtbs.gov), and the current year's mapping status.

U.S. Fish and Wildlife Service Fire Atlas Project

Poster Presentation

The U.S. Fish and Wildlife Service (FWS) is funding the U.S. Geological Survey (USGS) to compile Landsat image-based fire atlases for over 50 refuges and wildlife management districts across the conterminous United States. The USGS Earth Resources Observation and Science (EROS) Center is searching its historical archive in an attempt to locate Landsat scenes showing each of over 10,000 fires down to 25 acres in size. Each atlas will consist of yearly historical peak-of-green Landsat images back to 1984, immediate post-fire imagery showing each fire scar that is found, and a perimeter for each fire. Over fifteen refuge atlases have been completed. The poster will describe the procedures used to: 1) process thousands of Landsat scenes, 2) automatically search for fire scars in the imagery, and 3) applications of the Landsat image-based fire atlas.

Huang, Xinyan

Mr Xinyan Huang is a 3rd year PhD student in the Department of Mechanical Engineering at Imperial College London, funded by the Exceptional Overseas Scholarship. He is working with Dr Guillermo Rein in the area of Smouldering Combustion and Fire Science. His PhD thesis focuses both experimental and computational studies on smouldering fires of peat, the largest fire on the earth, including chemical kinetics, fire dynamics, and emissions. He has published 9 journal papers and more than 20 conference communications. He has been invited to give seminars in several institutions, and been the reviewer for 10 journals.

Computational smouldering combustion in peat fires: ignition, spread and extinction

Oral Presentation

Smouldering fire is the slow, low-temperature, flameless burning of porous fuels and the most persistent type of combustion. It is the driving phenomenon of wildfires in peatlands, like those causing haze episodes in Southeast Asia and Northeast Europe, but is poorly understood. Based on the micro-scale thermogravimetric experiment, the smouldering chemistry, includes the drying, thermal and oxidative degradations, can be modelled by the multi-step reactions, deepening the physical understanding on the smouldering propensity of organic soils. In order to model smouldering peat fires, a comprehensive one-dimensional model of a reactive porous media has been developed, solving the conservation equations and heterogeneous chemical reactions. The modelling results confirm the experimental smouldering thresholds, relating to the critical moisture and inert contents, in the literature for a wide range of peat types and organic soils. Afterwards, this model has been optimized to investigate the in-depth spread of peat fire into layers of heterogeneous profiles of moisture, mineral and density. Modelling results reveal that smouldering combustion can spread over peat layers of very high moisture (MC > 250%), and the critical moisture for extinction can be much higher than that for ignition. The predicted critical moisture values and depths of burn show a good agreement with the experimental measurements for field peat samples in the literature. This is the first time that the in-depth spread of peat fires is systemically studied based on a computational model to bridge the experimental data in the last decades, thus helping to understand this important natural and widespread phenomenon.

Response of a horizontal smouldering fire to a step-change increase of moisture content in superficial peat layers

Student Poster Presentation

The horizontal propagation of peat fires is mainly limited by the moisture content of the peat. In peatlands, the spatial distribution of superficial peat moisture content is variable, associated to the distribution of Sphangum moss. For the first time we studied the dynamics of peat fires propagating through peats with an interaction of two moisture contents. We designed a laboratory-scale experiment (22×18×6 cm) consisting in an insulated box filled with milled peat. The samples were ignited at one side of the box from which the smouldering fire horizontally self-propagated through a region of dry peat first and wetter peat later. An infrared camera and a webcam monitored the position of the fire from the surface. The experiment was repeated combining peats with different moisture contents. We analysed the propagation of a smouldering front after a sudden increase of moisture content and quantified the spread distance before self-extinction. Mixed-effects modelling was used to analyse the data, suggesting that the conditions of the peat, both before and after the step-change had and effect on the spread distance. We also predicted spread distance for a range of moisture content combinations, thus reproducing realistic scenarios.

Experimental Study on the Lateral Spread and Overhang Phenomenon in Smouldering Peat Fires

Student Poster Presentation

Smouldering combustion is the slow, low-temperature, flameless burning of porous fuels and the most persistent type of combustion. It is the driving phenomenon of wildfires in peatlands, like those causing haze episodes in Southeast Asia and Northeast Europe, but is poorly understood. This work experimentally investigated the smouldering fire spread over a bench-scale Irish moss peat samples under various moisture and wind conditions. Visual and IR cameras as well as a thermocouple matrix were used to measure the depth profile of lateral fire spread. The "overhang" phenomenon was observed where the smouldering fire spreads beneath the top surface, and the overhang thickness found increases with the moisture content and the wind speed. Experimental results showed that the lateral spread rate decreased with the moisture content, while increased with the wind speed. For dry peat, the lateral spread rate significantly decreased with the depth because of the decrease in oxygen supply. As the moisture content increased, the spread rate became less sensitive to the depth or the wind speed, suggesting moisture became more dominant in fire spread. In addition, the burning rate was controlled by both the fuel density and the moisture content, and also recorded the periodic behaviour of overhang. A simple heat transfer analysis was proposed to explain the influence of moisture and wind on the spread rate profile, and suggested that the overhang phenomena was caused by the spread rate difference between the top and the lower peat layers.

Hubbard, James

Jim Hubbard is the Deputy Chief for State and Private Forestry, U.S. Forest Service. In that role he oversees the Forest Service's fire management program, including wildfire response, fuel treatment mitigation, and partnership work.

Maximizing the intent of federal policy: managing ecology and protecting values

Oral Presentation

Managing wildfire to meet ecological and social imperatives is a difficult challenge, perhaps the greatest challenge in land management. We continue to see unacceptable tragic consequences of wildland fire and are often faced with very difficult seasons such as 2015. As we evaluate each ignition, full suppression is often the best response given the current circumstances. Yet, we know that fire is critical to maintaining diverse resilient ecosystems that provide multiple benefits to the public. Making the best decision for the landscapes, adjacent landowners, our partners, and the public is very challenging. It is not easy to understand and evaluate the immediate risk to fire personnel and the public, the risk of managing a fire with the uncertainty of long-term weather, as well as the long-term risk potential of excluding fire from the landscape. This talk will present the current factors that guide our application of federal wildland fire policy, and what we need to do to be prepared to manage more fire on the landscape.

Hudak, Andrew

Education and Training: 1999 Ph.D., Environmental, Population & Organismic Biology, University of Colorado 1990 B.S., Ecology, Evolution & Behavior, University of Minnesota Professional Research Experience: 2001-Present Research Forester, Rocky Mountain Research Station, Moscow, ID Designing and conducting applied landscape-level research on fuels and vegetation structure and function in relation to fire and other natural and anthropogenic disturbances using field and remotely sensed data. 1999-2001 Research Ecologist, Pacific Northwest Research Station, Corvallis, OR Characterized forest canopy structure in western Oregon from lidar and Landsat data, using statistical and geostatistical models for mapping of forest canopy structure and composition.

Rates of post-fire vegetation recovery and fuel accumulation as a function of burn severity and time-since-burn in four western U.S. ecosystems

Oral Presentation

Vegetation recovery and fuel accumulation rates following wildfire are useful measures of ecosystem resilience, yet few studies have quantified these variables over 10 years post-fire. Conventional wisdom is that recovery time to pre-fire condition will be slower as a function of burn severity, as in a dose-response relationship. We test this hypothesis across nine large wildland fires that burned with mixed severity 10-15 years ago using Landsat time series to characterize vegetation trajectories as a function of burn severity "dose" in four western U.S. ecosystems: mixed conifer (moist and dry), ponderosa pine, and chaparral. The LandTrendr approach is applied to reduce Landsat time series to measures of the date and magnitude of burn severity (i.e., dose) as well as the magnitude and duration of vegetation change (i.e., response) since disturbance. We use field data collected one year post-fire and within the past year to interpret the LandTrendr trajectories, their relationship to ground measures of tree regeneration, fuel accumulation, and plant diversity, and their utility for managers. We project recovery rates forward to predict when sites are expected to be restored to their pre-fire condition, as a function of initial burn severity, topography, climate, and vegetation type.

Huffman, Mary

Mary R. Huffman received her BS in Resource Conservation from the University of Montana, her MS in Botany from Miami University and her PhD in Forestry (fire science) from Colorado State University. Mary's career in applied research and fire management has provided adventures in fire from the arctic to the tropics, working with many partners in a variety of fire cultures. Whether serving as a land manager, researcher, burn boss, or director, Mary has always enjoyed connecting with people, landscapes and ideas - especially ideas about fire. Mary began working for The Nature Conservancy (TNC) in 1986, reintroducing fire to the Kitty Todd Preserve in Ohio. Later she served as a TNC project director in Florida, building fire management partnerships and citizen support for prescribed burning on the Lake Wales Ridge. When Mary began assisting her long-time mentor, Ron Myers, with community-based fire management in southern Mexico, she became intrigued by the complexity of traditional fire knowledge about tropical pine oak forests. This became the subject of her PhD dissertation. Mary currently serves as a TNC staff member of the Fire Learning Network, a partnership in which she provides coaching and facilitation to public land managers and communities that want to work together in new ways to shape their future with fire.

Making a world of difference in fire and climate change

Plenary Talk

Together with other stressors, interactions between fire and climate change are expressing their potential to drive ecosystem shifts and losses in biodiversity. Closely linked to human well-being in most regions of the globe, fires and their consequences should no longer be regarded as repeated surprise events. Instead, we should regard fires as common and enduring components of most terrestrial systems, including their social context. At the global scale, too much fire and the wrong kinds of fire are trumping not enough fire as the most influential fire problems we must ad¬dress. Intensified fire suppression and government prohibition of burning is not a long-term solution at the global scale. Acknowledging the importance of programs to reduce emissions from deforestation and forest degradation, I propose that fire ecologists come together to elevate attention on four less-discussed priorities: ecological systems in which people depend on fire for survival and well-being; systems in which governments unwisely insist on command and control approaches to fire; places where peat-lands are burning; and, places where climate-driven changes in fire will cause type conversion.

Hunter, Molly

Dr. Hunter is a Research Scientist with the School of Renewable Natural Resources at the University of Arizona. She has conducted applied fire science research pertaining to effects and effectiveness of different fuels management practices in forest and woodland systems throughout the Intermountain West. She currently serves as general science adviser for the Joint Fire Science Program.

Outcomes of fire science research: Is science used?

Oral Presentation

An assessment of outcomes from research projects funded by the Joint Fire Science Program (JFSP) was conducted to determine whether or not science has been used to inform management and policy decisions and to explore factors that facilitate use of fire science. In a web survey and follow up phone interviews, managers and scientists were asked about how findings from 48 completed projects had been applied and factors that acted as barriers or facilitators to science application. In addition, an investigation of recent planning documents was conducted to determine if products from the sampled projects were cited. All lines of evidence suggest that products and information from most (44 of 48) of these projects have been used by managers in some capacity. Science has mostly been used during planning efforts, to develop treatment prescriptions, and to evaluate current practices. Lack of manager awareness was a commonly identified barrier to application of science. Conversely, activities and organizations that foster interaction between scientists and managers were identified as facilitating the application of science. The efforts of the JFSP to communicate science findings and engage managers has likely contributed to the widespread application of the fire science they have sponsored.

Hvenegaard, Steven

Steve Hvenegaard has been a researcher with FPInnovations Wildfire Operations Research Program for five years. A large portion of his research work focuses on fire behaviour in masticated fuels in study sites across Western Canada. Prior to research work, Steve was a wildfire training specialist with the Alberta Wildfire Management Branch for eight years. Several years of firefighting experience with the Alberta Rapattack program were a strong asset in this position. Throughout these different phases of his career in wildfire, an inherent fascination with fire and love for working outdoors have evolved into a passion for exploring wildfire science.

Mastication Practices and Research – A Canadian Perspective

Oral Presentation

While much of the literature surrounding mastication of forest fuels is centred on research projects in the United States, the same general fuel treatment principles are applied across nations and wildfire management agencies. Canada has a wide variety of forest fuels in the boreal forest and other forested areas of Canada with good opportunities to explore universal research themes. Mastication has been used as a fuel treatment for over 15 years in Canada but there have been few opportunities to evaluate the effectiveness of masticated fuel treatments in moderating fire behaviour. In cooperation with Canadian wildfire management agencies and industry operators, FPInnovations Wildfire Operations Research Program is conducting research projects including experimental burns to address lingering research questions. Fire behaviour data collection through experimental burns is an optimum research method in these studies; however much can be learned about masticated fuel treatments and potential fire behaviour through studying and characterizing masticated fuel beds within the context of the surrounding fire environments. This presentation will summarize mastication research projects and findings from numerous sites across Western Canada. The presentation will highlight a recent experimental burn in central Alberta which used crown fire to test a masticated fuel treatment.

Hyde, Josh

Josh works with federal, state, tribal, and academic subject matter experts to create educational resources and outreach materials focused on wildland fire emissions and fuels management. As part of these efforts, he works closely with the National Wildfire Coordinating Group Smoke Committee (SmoC), Fire Research and Management Exchange System (FRAMES), the Wildland Fire Management Research, Development, and Application (WFM RD&A) Team, and the Pacific Wildland Fire Sciences Laboratory, where he is currently stationed. Josh's background includes a M. Sci. in Forest Resources focused on in large woody fuel consumption, and a B. Sci. in Rangeland Ecology and Management.

Addressing Smoke and Air Quality: Educational Resources on the FRAMES Emission and Smoke Portal

Poster Presentation

The ecological role of fire is crucial in maintaining many landscapes but its emissions can negatively impact the health and safety of large populations and carry regulatory implications. While proactive measures to address smoke have existed for many years and are continually advancing, there are few nationally-recognized training resources for land managers with the exception of the National Wildfire Coordinating Group's (NWCG) annual week-long Smoke Management Techniques Course (RX-410). The University of Idaho, the National Wildfire Coordinating Group Smoke Committee (NWCG SmoC), and the Fire Research and Management Exchange System (FRAMES) maintain the Emissions and Smoke Portal (www.FRAMES.gov/smoke) to make the latest information on smoke issues, research, and resources more accessible to all land management professionals. The Emissions and Smoke Portal highlights the latest smoke management and mitigation issues, research, and educational resources such as the Smoke Management and Air Quality for Land Managers modules and Smokepedia glossary. The portal search function provides easy access to data, documents, programs, projects, tools and web pages documented in the FRAMES Resource Cataloging System. This makes it easy for land management professionals to quickly stay informed on wildland fire smoke topics.

Ingalsbee, Timothy

Timothy Ingalsbee, Ph.D. is co-founder and executive director of Firefighters United for Safety, Ethics, and Ecology (FUSEE), and is co-director of the Association for Fire Ecology. Timothy is also an adjunct professor and research associate at the University of Oregon. Timothy is a frequent speaker and writer on fire ecology and management issues who began his career as a wildland firefighter for the U.S. Forest Service and National Park Service. In 1993 Timothy received the Oregon Conservationist of the Year Award by the Oregon Natural Resources Council. Timothy is a senior wildland fire ecologist certified by the Association for Fire Ecology.

Yearn to Burn: Ecological Fire Use for Restoration Objectives

Oral Presentation

Major scientific advances in fire ecology research, the technology used to monitor, map, and model fire spread, and critical policy reforms that authorize a wide range of options for managing wildfires should all be facilitating a significant expansion of fire use to restore ecosystem resilience in the face of unfolding climate change. Instead, the dominant wildfire response continues to be aggressive initial attack leading to full suppression. There are a number of social, economic, and environmental factors that present challenges to employing fire use, but this presentation will focus on the language used in fire management that is failing to nurture public and political support for expanded fire use. The concept of Ecological Fire Management will be offered to articulate a holistic synthesis of the principles and practices of prescribed burning, wildland fire use, and wildfire suppression in fire applications that seek to maximize the socioecological benefits of burning while mitigating adverse impacts to human assets. The term Ecological Fire Use will be proposed as the ideal phrase for clearly articulating the intentions and actions of fire managers in a way that builds public support for a shift from anti-fire suppressionist attitudes to a pro-fire restorationist ethos in wildfire management.

Iniguez, Jose

Jose is currently a Research Ecologist with the Rocky Mountain Research Station in Flagstaff Arizona. His current projects include several studies related to the impacts of recent wildfires on Southwest forests. His work has focused in southwest region United States particularly in the Gila and Sky Islands regions. Jose is interested in linking stand and landscape level processes related to fire and fire history. He is also the Scientist-in-Charge for the Long Valley Experimental Forest which is located 50 miles south of Flagstaff and contains >600 ac of the last remnant ponderosa pine forest.

Changes in forest structure relative to burn severity classes in the sky islands of southeastern Arizona

Oral Presentation

Satellite based maps of burn severity are now widely accessible, yet little is known about how mapped burn severity classes (typically low, moderate, and severe) relate to changes in traditional forest structure metrics such as basal area and tree density. We used data from vegetation plots, sampled across forest cover types using the same methodology before and after wildfires in the sky islands of southeastern Arizona, to assess changes in forest structure relative to mapped burn severity classes. We sampled pre-fire forest structure in 1994-1995 as part of a study of avian communities. Post-fire measurements were collected between 2009 and 2015. Wildfire impacts varied among cover types and forest structure metrics. Low severity fires had little impact on basal area, but reduced tree densities considerably in most cover types. High severity wildfires typically reduced basal area and tree density to very low levels in all cover types. Both basal area and tree density were reduced considerably in moderate severity burn patches in all cover types, but were not reduced to negligible levels as in high severity burns. Our results provide information that can aid managers in understanding the impact of these wildfires on forest structure in the sky islands.

Innes, Robin

Robin Innes is a contract Ecologist with the Missoula Fire Sciences Laboratory, part of the U.S. Forest Services' Rocky Mountain Research Station. She writes syntheses of information on fire effects and fire regimes for the Fire Effects Information system (FEIS, http://www.feis-crs.org/feis/). She has a master's degree in Ecology from the University of California Davis and a bachelor's degree in Wildlife Management from the University of New Hampshire. She lives in New Hampshire with her husband and daughter.

Finding information on fire effects and fire regimes

Oral Presentation

Managers and planners need current, scientifically sound information on fire effects and historical fire regimes. The Fire Effects Information System (FEIS) offers 3 products: Species Reviews, Fire Studies, and Fire Regime Syntheses. Species Reviews are syntheses of literature that describe plant and animals' relationships with fire. Fire Studies provide detailed results from research and management projects on vegetation, fire characteristics, and fire effects. Fire Regime Syntheses, FEIS's newest product, describe historical and contemporary changes in fire regimes in particular ecosystems. FEIS has nearly 1,100 Species Reviews, 160 Fire Studies, and a growing collection of Fire Regime Syntheses. It also provides information on approximately 185 fire regimes throughout the

United States, which are based on the 2,500 LANDFIRE Biophysical Settings. We will showcase these products and demonstrate the newly updated FEIS user interface (at http://www.feis-crs.org/feis/) , which enables users to search for these products by species name, geographic location, federal agency, plant community, life form, invasiveness, and nativity.

Jain, Theresa

Theresa B. Jain a Research Forester for the Rocky Mountain Research Station applies her silviculture and fuels expertise to designs studies and conduct science synthesis that provide understanding of how forests respond to native and exotic disturbances to develop management actions that can be molded into solutions to meet multi-faceted and complex management objectives no matter the agency or landowner. Of particular interest to fire ecologist and mangers is the dry mixed-conifer fuel treatment synthesis RMRS-GTR-292 which presents the ecology, management history, and fuel treatment options within the context of enhancing wildlife habitat, economic effectiveness, and treatment longevity.

Mastication Treatment Parameters: Can we alter post-treatment outcomes?

Oral Presentation

Mastication is a management technique for treating fuels, removing competition, and preparing site for regeneration. However, because live standing fuels are changed to dead surface fuels, there is concern over the increase in fire hazard and its longevity. Similar to other treatments, such as prescribed fire and grapple piling there are a plethora of implementation pathways that lead to a post-treatment outcome. Components such as the pre-treatment vegetation (life-form, tree species and size), machine type, and operator all of which can influence post-masticated outcomes and longevity. We sampled masticated sites throughout the Rocky Mountains (Idaho, South Dakota, Colorado, and New Mexico) on moist and dry conifer forests to 1) develop fuel models and 2) identify implementation parameters that influence the outcome and longevity of masticated fuel. We will present treatment implementation parameters that result in particular masticated outcome and fuel model with discussion concerning how to include these parameters in treatment planning and implementation and how subtle differences can influence fuel hazard and its longevity.

James, Joshua

Joshua James is a graduate student pursuing his M.S. in forest ecology at Michigan State University in East Lansing, MI. He has been employed by the National Park Service conducting fire ecology research and performing wildland fire operations. Joshua has a strong interest in applying fire ecology knowledge to promote public understanding and to assist in managing fire dependent ecosystems.

Red Pine Prescribed Burn Experiment

Student Poster Presentation

Fire plays a crucial role in red pine (Pinus resinosa) forests of the Lake States region by exposing mineral soil, preparing seedbeds, reducing understory competition, and influencing soil properties. A prescribed fire study was initiated in 1959 in a 90-year-old red pine forest in the Cutfoot Experimental Forest, Minnesota, to investigate the influence of fire on understory vegetation and soil chemical properties. The study consisted of seven experimental treatments that were excluded or subjected to prescribed fire at varying temporal and seasonal intervals with four unburned replicates. Soil properties were re-measured in 2015 to evaluate >50-year responses to these treatments. Results from the initial study revealed that fire reduced understory competition and nutrients in the forest floor and increased nutrients in the mineral soil without affecting site productivity. Results from 2015 will be presented on forest floor depth and mineral soil carbon, nitrogen, pH, and base cations to determine long-term soil responses to treatments. This study is unique because there are few long-term studies documenting the effects of prescribed fire on forest ecosystems and soil chemistry. Results from our study will help to further understand the role of prescribed fire within fire dependent ecosystems of the Lake States region.

Jandt, Randi

Randi Jandt, Fire Ecologist, Alaska Fire Science Consortium--located in the International Arctic Research Center at University of Alaska-Fairbanks. Worked as a wildlife biologist about 10 years and another 10 years as BLM's fire ecologist for the state of Alaska. Involved with BLM and USFS fire programs since 1981, and was Logistics Chief for an Alaska IMT. Research interests include the ecological effects of wildfires and impacts on moose and caribou in Alaska taiga and tundra. Coordinated the 2007 Anaktuvuk River fire study on Alaska's North Slope.

What do decision-makers need from science to maintain resiliency in a time of changing climate and fire regime in the boreal region?

Oral Presentation

The fire management community in Alaska is acutely aware that intensification of wildfire (Turetsky et al. 2011, Wolken et al. 2011) may be the catalyst through which climate warming could rapidly alter the structure and function of high northern latitude ecosystems. The 2015 fire season in Alaska and western Canada gave witness to the kind of expansive forest and tundra fires possible under climate warming in the North. This presentation illustrates just a few of the indicators of changes in fire weather and fire regime in recent decades, such as fire season length, burn acreages, temperature and lightning patterns. Scientific evidence of the fire regime change and its consequences is starting to mount, but how can that science be used to guide fire and land management policy? The impact of science on management policy is impeded by its fragmentation in the scientific literature and a lack of understanding by scientists of the issues relevant to management decisions (Driscoll et al. 2011) as well as limited funding and personnel resources, safety considerations, and the shifting winds of politics. The agencies charged with fire protection in Alaska are especially interested in changes in fire weather indices projected for the future, in better prediction tools, and in the real-time ability to track fuel moisture trends—especially in deep organic layers. Land managers and wildlife managers are especially interested in documenting trends in fire severity, as defined by the deeper combustion of organic layers during fires in boreal forest and tundra (Turetsky et al. 2015), and the resultant permafrost and vegetation response to deep burning. Some of these ecological relationships are unique to the high latitudes and are understudied relative to the number of fire severity studies in more temperate zones yet may play an essential role in global carbon balance and feedback mechanisms. Improving direct dialogue between decision-makers or their representatives and science providers can support the resiliency of agency response to a dynamic and changing fire regime in Alaska and Canada and the challenges or opportunities this might provide to fire managers. "Boundary" organizations like the Joint Fire Science Program's Fire Science Exchanges are exploring ways to enhance the co-production of science in forms that could be used to guide future fire policy and management.

Jardel-Peláez, Enrique

Enrique J. Jardel-Peláez Pelaez is professor of forest ecology at the Department of Ecology and Natural Resource Management-IMECBIO, University of Guadalajara, Mexico. He has been Field Manager of Las Joyas Research Station in the Sierra de Manantlán Biosphere Reserve and Director of the Manantlán Institute of Ecology and Biodiversity Conservation (IMECBIO). He conducts research on landscape ecology, disturbance regimes and ecological succession in tropical and subtropical montane forest ecosystems. He also provides technical assistance and training in community-based forest management, biodiversity conservation in managed forests, silviculture, protected area management, and fire management.

Fire regimes, fire management, and the diversity of pine forests and the genus Pinus in Mexico

Oral Presentation

Forty percent of the world's Pinus species are located in Mexico under diverse bioclimatic conditions and varying fire regimes, a key factor in the evolution of the genus. A multivariate classification of 47 Pinus taxa using fire-related functional traits yielded five different groups associated with specific bioclimatic conditions and fire regimes, described below. Group 1 clusters fire-dependent species with thin bark, serotinous cones, and branch retention, found in subhumid zones with Mediterranean climates that favor infrequent stand-replacing fires. Group 2 is formed of fire tolerant species (self-pruning trees with tall trunks, thick bark, and deciduous cones) found in humid-cold and temperate to warm life zones with summer rains and long dry seasons that favor frequent surface, low-severity fires. Group 3 includes intermediate fire-dependent and tolerant species with thick bark, serotinous or subserotinous cones, some with resprouting capacity and grass stages; these are found in warm to temperate humid climates favoring intense, frequent, high-severity fire regimes. Group 4 includes species in the Strobus subgenus, with traits like branch retention and thin twigs, which create fire refugia in mesic sites with infrequent fires. Group 5 is composed of pinion pines, fire-avoiding species growing in semiarid environments with infrequent, high-severity fires.

Jardel-Peláez, Enrique

Enrique J. Jardel-Peláez is professor of forest ecology at the Department of Ecology and Natural Resource Management-IMECBIO, University of Guadalajara, Mexico. He has been Field Manager of Las Joyas Research Station in the Sierra de Manantlan Biosphere Reserve and Director of the Manantlán Institute of Ecology and Biodiversity Conservation (IMECBIO). He has conducted research on landscape ecology, disturbance regimes and ecological succession in subtropical montane forest ecosystems. He also conducts technical assistance and training in community based forest management, biodiversity conservation in managed forests, silviculture, management of protected areas, and fire management.

Fire management and fire regimes in tropical montane forests of Mexico and El Salvador

Oral Presentation

The mountainous landscapes of Mexico and Central America are mosaics of conifer, oak, and mixed-hardwood forest vegetation interspersed with secondary scrub, induced grassland, and farmland. Different fire regimes coexist in these complex landscapes due to the variation of bioclimatic and soil-landform conditions, vegetation cover, fuel beds, and diverse land uses. Fire suppression policies prevail in the region, and the lack of knowledge of fire ecology is a limiting factor for fire management. To overcome these limitations and develop fire management plans for three protected areas (Sierra de Manantlán and Bosque La Primavera in Jalisco, Mexico, and Trifinio-Fraternidad in El Salvador), we employed a conceptual model to infer potential fire regimes (PFR) of landscape units characterized by bioclimatic conditions, geomorphology and fuel bed attributes by vegetation cover types. The hypothetical PFR was contrasted with the current condition of the fire regime to establish fire management prescriptions with an adaptive approach. To overcome the fire suppression approach and implement fire management strategies based on sound ecological principles, it is necessary to link these strategies with research, experimentation and monitoring, as part of a process of learning, adaptation and capacity building.

Jenkins, Michael

Michael J. Jenkins Associate Professor Dept. Wildland Resources Utah State University Dr. Jenkins is Professor and Director of the Disturbance Ecology and Management Lab at Utah State University, studying the interaction of select agents of disturbance in conifer forests over large spatial and long temporal scales. In recent years research has focused on the relationship between bark beetles, fuels and fire behavior, and forest snow avalanches in Rocky Mountain and European Forests. Dr. Jenkins recently returned from an 18 month-long, seven continents world tour conducting research on his new book, The Nature of Mountains, an exploration of the ecological and cultural landscape of the world's great mountain ranges.

Monitoring the Impact of Climate Change on Fire Frequency and Severity in Great Basin Bristlecone Pine Sky Island Ecosystems

Oral Presentation

High elevation five needle pines are rapidly declining throughout western North America due to warming temperatures, mountain pine beetle, white pine blister rust, and alteration of the naturally occurring fire regime. The impact of climate change is especially acute in sky islands of the Great Basin as warming temperatures alter tree distribution and contribute to overstory tree mortality. Great Basin bristlecone pine forests occur as ecological islands at the highest elevations of mountain ranges separated by extensive rangeland or desert basins. Great Basin bristlecone pine ecosystems are highly fragmented and contain many biodiversity "hot spots" with a high degree of species endemism. It is the fragmentation history and the number and character of the sky islands that are key to understanding biodiversity of Great Basin bristlecone pine forests. This paper will address the effects of climate change on Great Basin bristlecone pine forests. Specifically we will discuss climate-induced changes to the fire regime through alteration of surface and canopy fuel loading, fire hazard and risk, and on predicted changes in fire behavior and severity. Secondly we will evaluate Great Basin bristlecone pine volatile organic compounds across elevation gradients to assess changes in tree biochemistry in response to climatic stress.

Jimison, Yvonne

Yvonne Jimison is an MS student at Texas Tech University, in Lubbock, Texas, where she is studying the effects of smoke on germination of seeds native to the central grasslands in North America.

Influence of Smoke on germination of species in the Southern High Plains, USA

Oral Presentation

Smoke from burning vegetation is well-known to influence germination of some species, especially those that are native to fire-prone vegetation types. Although fire was likely important for maintaining the structure and composition of the central grasslands in North America, little is known about how germination of grassland species in this region respond to smoke. We tested twenty one species for germination response to smoke, cold stratification, and heat, and found 6 instances of smoke stimulating germination by either increasing germination percent or decreasing germination time, or both. Eight species responded to smoke by reducing germination percent or slowing germination time. Other species displayed no response. Individual positive and negative germination responses to smoke might suggest potential single-species management or restoration treatments, but we suggest that identifying patterns of response and understanding how smoke treatments interact with other environmental cues such as stratification or heat would be more fruitful. For example, of the seven species in Asteraceae that have been tested, four experienced decreased germination and one experienced increased germination. Likewise, many of the tested species also displayed idiosyncratic interactions with degree of smoke exposure, stratification, dry cold, and/or heat treatments. Understanding and eventually predicting these responses would improve vegetation management and restoration even more than a focus on the simpler single-factor responses.

Johnson, Morris

Morris Johnson is a Research Fire Ecologist with the US Forest Service, Pacific Northwest Research Station, Pacific Wildland Fire Sciences Laboratory in Seattle, WA. Morris began his Forest Service career on the Rouge River/ Siskiyou National. He was a member of both the Redmond and Redding Interagency Hotshot crews. His research focuses on: (1) fuel treatment effectiveness, 2) effects of salvage logging on fuel accumulation and potential fire behavior, 3) bark beetle effects and fire behavior, and 4) simulation modeling. He received a B.S. in Urban Forestry from Southern University, and a M.S. and Ph.D from the University of Washington in Seattle, WA.

Evaluating fuel treatment effects in defensible fuel profile zones, Lassen National Forest, Bald Fire 2014

Oral Presentation

The 2014 Bald Fire burned 15,950 ha on the Lassen National Forest, Hat Creek Ranger District between July 31 and August 6. The fire burned through several fuel treatment areas including defensible fuel profile zones, which were designed with the goal to change wildfire behavior and increase fire suppression capacity. After the fire we measured 470 permanent plots installed on 18 linear transects to reconstruct both untreated and treated pre-fire vegetation. We compare forest structure and fire severity (represented by crown scorch and bole char) between the treated and untreated area. The transects were oriented in the direction of fire spread across the treatment boundaries, enabling the estimation of non-linear models to the relationship between several severity metrics and distance from the treatment edge. The non-linear curve provides an estimate of the distance into the treated area at which the severity metric is substantially reduced.

Fuel mass and stand structure after salvage logging of a severely burned Sierra Nevada mixed-conifer forest

Poster Presentation

The 2014 King Fire which burned 39,550 ha on the Eldorado National Forest, Georgetown, Placervile, and Pacific Ranger Districts has presented the opportunity to establish a long-term project to evaluate the effects on salvage logging on fuels and future re-burn hazard. In a randomized complete block design, we evaluate three levels of salvage logging treatments (unsalvage, partial salvage , and full salvage) within eighteen 2.2 ha treatment units. Within each treatment unit, twenty-four permanent grid points were established to measure standing overstory vegetation and dead woody fuels. We will collect data before and after the salvage logging operations and will use the Fuel Characteristic Classification System to estimate change in fire behavior indices (reaction intensities, flame length, and rate-of spread) and fuel loadings.

Jones, Justice

Justice Jones earned two Bachelor's Degrees from the University of Texas at Austin in Environmental Resource Management and Cultural Anthropology. Prior to attending the University of Texas Justice served in the United States Air Force where he participated in several missions abroad including two tours during Operation Desert Storm. He is member of the International Society of Arboriculture and a Certified Arborist. Justice currently serves as the Wildfire Program Manager for the Austin Fire Departments' Wildfire Division. The Division works to enhance the city of Austin's resiliency to the impacts of wildfire.

Rapidly Fire Adapted: A journey from at risk to empowered

Oral Presentation

When as tallies were made, the Bastrop fire a mere 40 minutes away from downtown Austin was the third most economically impactful fire in US History. Over 1600 Homes were destroyed with most of those losses occurring during the first 24 hours, fire behavior was so that extreme the operational focus shifted to evacuation and preservation of life. This was a wakeup call that shook Central Texas at its core, and for the first time caused many to question their surrounds in a new light. The City of Austin found itself without a plan, in one of the highest risk areas of the country. That's when the offer to join the Fire Adapted Communities Learning Network presented itself. Being a part of the FAC Learning Network is facilitating benchmarking with other communities at risk, increasing exposure to novel research and subject matter experts, and providing a better understanding of the power of collaboration. The Austin Fire Department hopes to learn from the successes and challenges that other communities have experienced, and to develop a model for wildfire preparedness that other large municipalities and counties can use to rapidly implement a local cohesive strategy.

Jurskis, Vic

Vic Jurskis worked as labourer, forester, researcher, manager and finally as Silviculturist for Forestry Commission of New South Wales from 1976 until 2012 when the organization was 'corporatised'. He retains a passion to restore healthy, safe and resilient ecosystems using the firestick as applied in Australia for forty thousand years until 1788, and for a couple of decades after 1960. Vic's evidence to three State and Federal Parliamentary Inquiries into land and fire management has figured in their recommendations which unfortunately have not yet translated into sustainable management. His latest effort is a book titled Firestick Ecology, released last month.

How does the firestick maintain healthy and resilient ecosystems?

Oral Presentation

The firestick, climates and soils shaped global biomes. In Australia and North America, grasslands and savannas occupied many sites that can physically support forests, whilst forests and scrubs invaded such sites after Aboriginal burning was disrupted. Woody thickening, loss of biodiversity, uncontrollable megafires and irruptions of pests, parasites and diseases of trees were consequences. Ecologists studying these problems mostly concentrate on climatic variability, paying little attention to the fundamental role of Aboriginal burning in pre-European ecosystems. Consequently, increasing megafires and forest health problems have been attributed to recent climate change. When deliberate burning is considered, its effects on vegetation structure and its direct impacts on trees are typically the focus. However, the firestick influenced soil development, and nutrient cycling as well as vegetation structure. Woody thickening, pestilence and megafires affected grassy ecosystems immediately after Aboriginal management was disrupted, and before any possible climatic impacts of the Industrial Revolution. Maintenance of safe and resilient vegetation structure by mild burning is well understood in Australia and North America. Less understood is the role of fire in soil formation and cycling of nutrients, particularly nitrogen. We recommend further investigation of this role in maintenance of ecosystem health and resilience, particularly in North America.

Kane, Jeffrey

Jeff Kane is an Assistant Professor of Fire Ecology and Fuels Management in the Department of Forestry and Wildland Resources at Humboldt State University and is the Director of the Humboldt State Wildland Fire Lab. Jeff serves as the chair of the AFE Education Committee.

Post-fire tree mortality model assessment following prescribed burning treatments in National Park units of the western U.S.

Oral Presentation

Managers require accurate post-fire tree mortality models to assess the effectiveness of prescribe fires to maximize treatment objectives. Here we examined the performance of a commonly used post-fire tree mortality model with a geographically robust monitoring dataset of 18 tree species (12 gymnosperms, 4 angiosperms) from 16 National Park Service units in the western U.S. Model performance was generally good with 12 of the species having tree mortality predictions within 20% of the observed values, however, correctly classified dead trees ranged between -5 and 43%. Variation in model accuracy among species pooled across sites was not related to sample size ($r2 < 0.08$, $P > 0.24$), bark thickness species multiplier ($r2 < 0.17$, $P > 0.09$), or observed mortality ($r2 < 0.09$, $P > 0.22$). However, we did find a significant relationship between bark thickness species multiplier and the percentage of correctly classified live trees, where thicker bark species had more live trees correctly classified ($r2 = 0.62$, $P = 0.0001$). These results indicate that the commonly used post-fire mortality model generally performs well, however, thinned barked species and angiosperm tree species would benefit from model improvements.

Kasaona, Marthin

Marthin Kasaona, Senior Conservation Scientist at Etosha Ecological Institute within the Ministry of Environment and Tourism. His primary role is a fire coordinator responsible for the implementation of Patch Mosaic Burn within Namibia protected areas. Mr. Kasaona holds a Masters Degree in Environment and Development , he majored in Environmental Management Stream from the University of KwaZulu-Natal, South Africa; B-Tech degree in Nature Conservation from Nelson Mandela Metropolitan University in South Africa. In addition, Mr. Kasaona has a National Diploma in Natural Resource Management: Nature Conservation from Polytechnic of Namibia. He is also an Advisory Board Member and Collaborator on Bats without Borders, a Charity Organization registered in Scotland. He is an adjunct lecturer who teaches courses related to Community Based Conservation issues with special focus on southern Africa and Namibia as a model case study.

APPROACH ON PATCH MOSAIC BURN SYSTEM IMPLEMENTED IN ETOSHA NATIONAL PARK, 2012 Ever wondered why there is a ‘smokey haze’ in some area of Etosha National Park?

Plenary Talk

As per guiding principle of Fire Management under the fire section in Etosha Management Plan, ‘fire is an integral part of the environment in ENP and will be applied primarily to reduce fuel loads to limit the size and scale of fires’ and hence contribute to the overall objective of the Park Management Plan which promotes maintenance of biodiversity. Fire is critical for the healthy functioning of ecosystems in Africa, and is widely regarded as key biodiversity component [Du Plessis, 1997; Trollope, and Trollope, 2004]. In addition, fire is a major disturbance force and is regarded an important determinant of savanna vegetation. Fire plays role primarily in modification of the vegetation from homogenous into heterogeneity if properly applied in protected areas. Fires are fundamental in shaping Etosha National Park’s [ENP] biodiversity and have an important role in removing moribund vegetation [Stander et al, 1993; Berry, 1997], facilitating the co-existence between trees and grasses, and controlling the encroachment of trees upon grasslands Siegfried [1981]. In early 2012, Etosha National Park was a recipient of the Fire Station Terminal from the African Monitoring of Environment for Sustainable Development [AMESD]. With acquisition of the fire station and change of people perception from staff level to policy makers on the role of fire, the park has initiated the implementation of a PATCH MOSAIC BURNING SYSTEM. In accordance with this system fires are ignited at selected localities and left to burn creating a natural patch mosaic of burnt and unburned veld. These fires are monitored by the African Monitoring of Environment for Sustainable Development [AMESD] Fire Station based at Okaukuejo, Etosha Ecological Institute.

Kasaona, Marthin

Marthin Kasaona, Senior Conservation Scientist at Etosha Ecological Institute within the Ministry of Environment and Tourism. His primary role is a fire coordinator responsible for the implementation of Patch Mosaic Burn within Namibia protected areas. Mr. Kasaona holds a Masters Degree in Environment and Development , he majored in Environmental Management Stream from the University of KwaZulu-Natal, South Africa; B-Tech degree in Nature Conservation from Nelson Mandela Metropolitan University in South Africa. In addition, Mr. Kasaona has a National Diploma in Natural Resource Management: Nature Conservation from Polytechnic of Namibia. He is also an Advisory Board Member and Collaborator on Bats without Borders, a Charity Organization registered in Scotland. He is an adjunct lecturer who teaches courses related to Community Based Conservation issues with special focus on southern Africa and Namibia as a model case study.

Control Burning Program in Etosha National Park, Namibia ~ "The Old vs. The New fire Management Approach

Poster Presentation

Fire is a fundamental ecological process and critical for the sustained functioning of savanna ecosystems in Africa. Accordingly, the wise use of fire is a key management intervention for maintaining biodiversity in Etosha National Park. In this regard, fire plays an important role in removing moribund inedible vegetation, stimulating new growth for animals to feed on, facilitating a balance co-existence between trees, shrubs and grasses and the control of encroachment of bush upon grasslands. The ultimate desired outcome of this is the maintenance of the interesting variety of landscapes, vegetation communities and large wild animals that tourists visit the Park to view. In Etosha, the previous fire management practice of suppressing all fires was ineffective as accidental fires inevitably occurred each year. Most of these accidental fires occurred during the hot, dry months of the year which lead to large areas being burnt homogenously and intensely by hot fires. This was not only detrimental to the vegetation and landscape diversity of the Park in the long-term but also the cause of high mortality of wild animal in such fires. These circumstances necessitated the re-evaluation of the Previous fire Management Approach and the re-introduction of the Patch Mosaic Burn in 2012 as a "New" Fire Management Approach in Etosha.

Kavanagh, Kathleen

Dr. Kathleen Kavanagh began her role as Department Head of the Ecosystem Science and Management Department in the College of Agriculture and Life Sciences at Texas A&M University in 2014. Prior to that, Dr. Kavanagh was on the faculty at the University of Idaho for 14 years. She is a forest ecologist whose research contributes to our fundamental understanding of how forest ecosystems function and the assimilation of this knowledge into natural resource management. Of note is a 2010 publication with her co-authors in Fire Ecology on modeling the physiological consequences of fire.

Effects of heat plumes on tree canopy hydraulics

Oral Presentation

Many tree species have evolved with wildfire. Therefore, there should be mechanisms limiting mortality following canopy heat exposure. In turn, it is probable these mechanisms could influence fire behavior. Our research examines the hydraulic response of isolated branches to sharp increases in atmospheric temperature (below 60oC). When starting with fully hydrated branches with open stomata and ready access to water, stomata remained open during heat exposure maintaining a three-fold increase in transpiration rates relative to an unheated canopy. However, foliar hydraulics are very different when a droughty branch encounters a heat plume. In this case there is a sudden increase in transpiration but it is not sustained, indicating that closed stomata are limiting transpiration and thus latent heat loss. In all branches tested, the needles that first intercepted the heat plume were discolored, had a 40% reduction in moisture content, completely closed stomata, and a leaf water potential that was higher relative to the non-discolored needles. The level of cavitation events, as measured by acoustic emissions, increased in the discolored needles. These results are consistent with latent heat losses cooling the needle and delaying injury. However, once cavitation occurs, the stomata fully close and the needles heat more readily.

Keane, Robert

Robert E. Keane is a Research Ecologist with the USDA Forest Service, Rocky Mountain Research Station at the Missoula Fire Sciences Laboratory His most recent research includes 1) developing ecological computer simulation models for the exploring landscape, fire, and climate dynamics, 2) conducting field research on the sampling, describing, modeling, and mapping of fuel characteristics, and 3) investigating the ecology and restoration of whitebark pine. He received his B.S. degree in forest engineering from the University of Maine, Orono; his M.S. degree in forest ecology from the University of Montana, Missoula; and his Ph.D. degree in forest ecology from the University of Idaho, Moscow

Simulating future tree mortality under climate change with interacting disturbance

Oral Presentation

Interactions among disturbance, climate, and vegetation determine landscape patterns and influence most ecosystem processes, especially those that cause tree mortality. Dynamic and reciprocal interactions among disturbances can also temporarily or persistently alter landscape trajectories, especially in new climate regimes. Ecological models are used routinely to explore ecological dynamics across heterogeneous landscapes, but few models are able to simulate tree mortality resulting from multiple interacting disturbance events. Projecting how multiple disturbance interactions might result in novel and emergent landscape behaviors is critical for addressing climate change impacts and designing land management strategies that are appropriate for future climates. In this presentation, we explore trends in tree mortality from interacting disturbances using landscape simulations of a fire-dominated, forested ecosystems of the northern Rocky Mountains, USA, where mountain pine beetle, white pine blister rust, and wildland fire interact with the vegetation and climate to create unique landscape behaviors. Our findings are that (1) multiple disturbance interactions influence tree mortality more than single or no disturbances; (2) disturbance regimes are mediated through changes in tree mortality and fuels; (3) disturbance interactions often overwhelm direct effects of climate changes on ecosystems.

Physical and chemical characteristics of surface fuels in masticated mixed-conifer stands of the western United States

Oral Presentation

Wildland fuel mastication is rapidly becoming the preferred fuel treatment for many fire hazard reduction projects, especially in areas where reducing fuels with prescribed fire is challenging. Mastication is the process of mechanically modifying the live and dead surface and canopy biomass to lower fuelbed depth and increase bulk density to reduce fire hazard. The problem is that little is known about the impacts of mastication on the ecosystem, fuelbed, and fire behavior if the masticated fuelbed is burned. In 2013, we initiated a comprehensive study called MASTIDON (MASTIcated Decomposed fuel Operational Network) to measure the diverse characteristics of masticated fuelbeds at treatment sites of different ages to evaluate effects of different aged masticated fuelbeds on fire behavior, fuel moisture dynamics, soil heating, and smoldering combustion. These investigations were then used to build fire behavior fuel models for masticated fuelbeds for use in operational fire management. This presentation presents a small aspect of MASTIDOM – the detailed summaries of the physical and chemical fuel properties of the different aged sampled masticated fuelbeds and the relationships of these properties to fuel age and other fuelbed characteristics. Masticated fuelbeds have unique properties that are not fully addressed by current fire behavior simulation systems.

Keeley, Jon

Jon E. Keeley, is a Senior ST research scientist with USGS, adjunct professor at UCLA, former program director at NSF, recipient of a Guggenheim Fellowship and ESA Fellow. He has spent sabbatical leaves in all of the mediterranean climate regions of the world. Dr. Keeley has over 350 publications in national and international scientific journals and books and have garnered more than 15,000 citations. He is senior author of a 2012 Cambridge University Press book Fire in Mediterranean Climate Ecosystems: Ecology, Evolution and Management.

Fire Climate Relationships Along Latitudinal and Elevational Gradients in California

Oral Presentation

California is a highly fire-prone landscape with very different fire regimes from north to south and from low to high elevation. Over the past 100 years the southern part of the state has had substantially greater area burned and the greater numbers of fires than the northern part of the state. Across California there are major differences in the relative roles of climate vs human land management practices. In general, in lower elevations and in the southern part of the state climate plays a far less critical role than human caused ignitions. These results suggest predicting future fire regimes will be strongly affected by global warming on some landscapes and on other landscapes such climate changes will be over-shadowed by anthropogenic impacts.

Mechanisms of Smoke Induced Seed Germination

Oral Presentation

Smoke induced seed germination was first reported for a postfire annual species in chaparral. It has been demonstrated that other combustion products such as charred wood can trigger germination. Many other species in Mediterranean climate shrublands have deeply dormant seeds that are triggered to germinate in response to smoke. This trait plays an adaptive role in timing germination to postfire conditions. In subsequent decades it has been shown that smoke is also capable of enhancing germination of agricultural crops such as lettuce, tomatos and others, so clearly this is not always a trait selected for timing germination to postfire environments. The mechanism behind smoke stimulated germination has been a matter of some dispute. Organic chemists that have addressed this issue have, not surprisingly, concluded it is an organic component of smoke that is the actual cue to stimulate germination and one of these is a type of butanoloide, specifically karrikin. This school has also proposed this is a universal stimulant and relates to early plant/fungal interactions, however, this butanolide is not a universal germination stimulant. An alternative hypothesis is that smoke stimulated germination in fire-adapted floras is a convergent evolutionary trait and has resulted from multiple pathways responding to different smoke components.

Kelley, Brian

Brian Kelley attended Northern Arizona University where he obtained his Bachelor of Science in Forestry and a Certificate in Fire Ecology and Management. During the summers he works on a wildland fire crew with the Coconino National Forest. He continues his education at NAU pursuing a Masters of Science degree in Forestry.

Managed Fire in Southwestern Forests

Student Poster Presentation

Decades of effective fire suppression have led to high fuel loading across the western U.S. causing high severity wildfires. With such high fuel loading causing high severity wildfires, managers seek alternative treatments to reduce fire hazard. Management of natural ignitions to meet management objectives is one option that has recently gained support across the southwest. However, management of natural ignitions during fire season poses some challenges to fire managers. There are both internal (within agency) and external (outside agency) challenges that fire managers must overcome for effective use of wildland fire managed for multiple objectives. There has been substantial research conducted regarding external issues associated with burning treatments in the forest. Internal issues, on the other hand, have not been deeply evaluated. Through interviews and surveys I plan to evaluate the internal challenges associated with implementation of wildland fire managed for multiple objectives. I plan to focus on the Northern Arizona region (including the Coconino and Kaibab National Forests), as this area currently utilizes this management technique. Research will be collected from a variety of disciplines to evaluate the concerns of this practice as they pertain to different resource entities such as range, recreation, timber, etc.

Kellogg, Elizabeth

Elizabeth Kellogg, President, Tierra Data Inc. Elizabeth has 30 years of experience in the planning, management and implementation of natural resources projects in California and the western U.S. Elizabeth is recognized for her expertise in integrated, collaborative natural resources and wildland fire management planning, rangeland management, biological assessment, long-term monitoring program design, conceptual habitat restoration planning, and wetlands delineation and assessment. She has been the primary author of over 20 integrated natural resources management plans that have multiple national awards.

Restructuring Wildland Fire Management for an Army Training and Testing Center in a Great Basin Cheatgrass-Dominated Landscape

Poster Presentation

Maintaining flexibility for military training, while protecting life, facilities, and natural resources can present labyrinthine tradeoffs for managers facing wildfire threats. This is especially true at Dugway Proving Ground, where wildfire can convert sagebrush into cheatgrass-dominated landscapes. To maintain flexibility for military training while limiting ignitions, we developed a new fire danger announcement system using the Energy Release Component (ERC) from three on-installation RAWS, and wind speed using 25 Dugway meteorological stations. Fire danger categories were created using local meteorological records, fire history, and fuel models. These categories are Dugway-specific as they categorize fire danger according to firefighting resources, and provide precautions for training activities. This system provides flexibility for military trainers; areas exhibiting lower fire danger can remain open to a wider range of training activities. To prioritize pre-suppression actions, we employed a values-at-risk approach using vulnerability assessments. Stakeholder interviews identified resources and assessed their value to produce a ranking thereof. Stakeholders included military trainers, the fire department, natural resources, and others. Each resource was assigned a sensitivity ranking, which was then combined with an exposure ranking based on fire frequency, cheatgrass, and ignition sources. This composite produced a vulnerability map, allowing for the design and prioritization of fuelbreaks

Kemp, Kerry

Kerry Kemp is a PhD candidate in the College of Natural Resources at the University of Idaho. Her research focuses on the interactions between wildfire, climate, and forest resilience across landscapes. Kerry has a BA in Ecology and Evolutionary Biology from the University of Colorado, Boulder. She has also participated in research with the US Forest Service on Sudden Aspen Decline and on fire suppression impacts on forest structure in the central Sierra Nevada mountains. While not working, Kerry loves to ski, backpack, and spend time in the mountains.

Fire mediates the role of climate in determining tree regeneration patterns in mixed conifer forests of the U.S. northern Rockies

Oral Presentation

The distribution of many tree species is expected to shift in response to future climate change. These shifts could be strongly mediated by wildfire through fire effects on tree mortality and seedling recruitment. To understand how fire mediates the role of climate in determining suitable habitat for seedling regeneration, we studied post-fire forest regeneration across 177 mixed conifer forest sites in the U.S. northern Rockies. We used generalized additive models to quantify how the density of Douglas-fir and ponderosa pine seedlings were influenced by climatic (e.g., temperature, precipitation, soil moisture, and evapotranspiration) and fire-related factors (i.e., distance to live seed sources, live tree stand density, and satellite-derived burn severity). Douglas-fir and ponderosa pine seedling densities were most closely linked to mean summer temperatures, with greater abundance where temperatures were between 14 and 16 °C. Douglas-fir establishment was also influenced by the distance to live seed sources. While seed source limitations impact whether seeds can successfully disperse into a burned area, suitable climate may be equally important for successful establishment. Our results imply that increasing future summer temperatures may not only lead to larger and more frequent fires, but less regeneration where the climate has become less suitable for tree establishment.

Kerns, Becky

Becky K. Kerns is a research ecologist with the USDA Forest Service, Pacific Northwest Research Station in Corvallis, OR. She holds a Ph.D. in Forest Science from Northern Arizona University. Becky has been conducting research the past 20 years to develop knowledge and understanding about how natural and human-caused disturbances and their interactions affect the structure and function of plant communities, and how this information can be used to develop management and adaptation practices to achieve land management goals and promote ecological resilience to disturbances. She is currently the PI for the Season and Interval of Burn Study.

Prescribed fire regime effects on fuel structure in an eastern Oregon ponderosa pine forest

Oral Presentation

Thinning and prescribed burning are typically conducted in dry forests of the western US to restore ecologically resilient forest conditions and reduce fire severity. Repeat burning simulates natural fire regimes, but there is limited information regarding optimal burn intervals and seasonality in relation to desired fuel conditions. We evaluated repeated seasonal (spring and fall) burning effects at two intervals (5- and 15-yr) on fuel structure, including litter and duff (LD), woody fuels (WF), and height to live crown (HLC). The study was conducted using six stands of ponderosa pine located in the southern Blue Mountains. Thinned stands were burned in the fall of 1997 and spring of 1998. Initial fall burns reduced LD over that of the controls, but spring burning did not. By 2014, after four 5-yr and two 15-yr burns, all treatments had reduced LD compared to controls. Five-year fall reburning resulted in the highest total WF load while 5-yr spring reburning resulted in the lowest. This was primarily owing to higher tree mortality in the fall 5-yr units. None of the treatments raised HLC compared to the control. A widespread pine butterfly outbreak that started in 2008 may have obfuscated HLC results in relation to burning.

Kessler, Nicholas

Nicholas V. Kessler is an Agnese Haury Graduate Fellow in archaeological dendrochronology at the University of Arizona, Laboratory of Tree Ring Research. He is a contributor to ongoing research in western New Mexico which focuses on understanding thresholds of anthropogenic environmental change at the local to landscape scale.

Historical land use and changes in fire occurrence in a piñon-juniper woodland, Cebolla Canyon, western New Mexico

Oral Presentation

Cebolla Creek Canyon in the El Malpais National Conservation Area (EMNCA), western New Mexico, has been occupied for several thousand years by Archaic, Basketmaker, Ancestral Puebloan, Hispanic, Navajo, and Anglo-American Groups, each of whom exploited resources of the area in a particular ways. The goal of our project is to understand how specific temporal and spatial patterns of land use interact to create landscape-scale changes in natural systems, and the varied human histories in the El Malpais area make this location ideal for gathering pertinent data. This paper shares preliminary results from a fire scar study in forest stands at the ponderosa-piñon-juniper transition zone in the EMNCA. These results are discussed in the context of the regional fire-climate history, as well as the variety of local historical land uses which have affected fire occurrence by altering fuel and ignition dynamics. Our discussion focuses on the possibilities for modeling how humans have affected environmental changes in the past, and how quantitative comparisons might be made between the scale of human activities and dynamic natural processes.

Kidd, Kathryn

Kathryn R. Kidd works as a Postdoctoral Associate in the Department of Forest Resources & Environmental Conservation at Virginia Tech. Her research is focused on the effects of forest disturbances (e.g., fire, silviculture, pests, invasive species) on stand dynamics, tree-growth responses, forest restoration, regeneration, and water quality from a management or restoration perspective.

Hardwood sapling allocation to bark thickness, height, and radial growth 3 years post-wildfire in the southern Cascades

Poster Presentation

Tradeoffs in resource allocation to aboveground tree growth reflect species disturbance survival strategies and can reveal fire-adapted traits. Thick bark, a fire-adapted trait, provides protection of cambial tissues and reproductive basal buds from lethal temperatures during fire. This study quantified tradeoffs in radial growth, bark thickness, and height of co-occurring dominant California black oak (Quercus kelloggii), Oregon white oak (Q. garryana), canyon live oak (Q. chrysolepis), bigleaf maple (Acer macrophyllum), and Pacific dogwood (Cornus nuttallii) sprouts from top-killed stems, three years after a high-severity wildfire in the southern Cascades, California. Results reveal fire-adapted oaks allocated resources to increase bark thickness while bigleaf maple, a fire-sensitive species, invested resources into height and stemwood growth. Further evaluation of bark:stemwood ratios confirmed slower wood cell radial growth rates in fire-adapted oaks than in fire-sensitive species.

Similarly, bark:height ratios determined at 20 cm height increments were greater for the fire-adapted oaks than fire-sensitive Pacific dogwood and bigleaf maple, the most fire-sensitive of the species. Interpretation of resource allocation patterns is critical to identify fire-adapted traits and species survival strategies needed to understand disturbance impacts on stand dynamics.

Kinoshita, Jun

Jun R Kinoshita – Fire Archeologist, Yosemite National Park, National Park Service, Yosemite, California. Jun began his career with the National Park Service while in graduate school at Oregon State University, working seasonally as an archeological technician at Klondike Goldrush National Historical Park in Skagway, Alaska. After four seasons he landed a term position at Yosemite National Park as the Fire Archeologist in the fall of 2001. In 2005 the position became permanent. Jun is co-coordinator of the Resource Advisor (READ) Program at Yosemite, building the bridge between Resources Management and Science and Fire Management. Working closely with regional and national fire management staff he has helped develop and present a READ training around the country. Jun works closely with fire management, as the Fire Archeologist responsible for cultural resource compliance, as a wildland firefighter, a structure firefighter, EMT and all-hazard READ. He also assists with Burned Area Emergency Response (BAER) within the park. Jun received his B.A. in Liberal Arts from the University of Illinois in 1998 and his M.A. in Archeology from Oregon State University in 2004.

A History of Archeologists on the Fireline.

Oral Presentation

This paper looks at multiple definitions of the Fire Archeologist position from a historical perspective through legislative drivers, funding, and skills. Working from these definitions, we explore concerns regarding how climate change is changing threats to sites, evolving research trends, and changes in philosophy and policy. The success that these positions have had in documenting and protecting historic properties from the effects of fire and fire management operations in fuels treatments and wildfires has contributed to the overall body of knowledge which facilitates larger management goals.

Klein, Robert

Robert Klein is a Fire Ecologist with the National Park Service based out of Great Smoky Mountains National Park in Tennessee, USA. He has been involved in prescribed fire restoration and fire effects monitoring with the National Park Service for over 16 years. Robert has been involved in numerous research projects concerning fire ecology and fire effects, and had been a co-author on several refereed publications.

Landscape Assessment of Burn Severity in the Appalachian Mountains, USA

Poster Presentation

Multi-temporal remote sensing of burn severity has proven to be an effective tool for fire effects monitoring and research in many forest types across the United States. However, aside from a small handful of studies, the interpretation of burn severity maps in the Appalachian mountains of eastern North America has remained largely unexplored. Between 2002 and 2014, fire effects monitors from Shenandoah and Great Smoky Mountains National Parks sampled 206 Composite Burn Index (CBI) plots across 15 fires (8 SHEN, 7 GRSM) to determine the relationship between remotely-sensed and ground-based burn severity. Simple linear regression showed a clear relationship ($R2=0.74$) between overall CBI score and differenced Normalized Burn Ratio (dNBR) values. This study also provides recommendations for timing of Landsat image acquisition and thresholds for severity classes observed across multiple burns. The results of this study suggest that Landsat-derived burn severity maps can provide a useful tool for modeling landscape-scale fire effects in the Appalachian Mountains, which can complement plot-based monitoring of prescribed fire restoration efforts, and increase understanding of tradeoffs in wildfire management decisions.

Klimaszewski-Patterson, Anna

Anna Klimaszewski-Patterson is a Ph.D. Candidate in the Department of Geography at the University of Nevada, Reno. Her current research focuses on paleoecology, environmental archaeology, and landscape modeling. She is developing a novel approach to examining paleolandscape change through potential anthropogenic vs. climate-driven scenarios.

What's really driving 2000 years of forest change in the southern Sierra Nevada, California

Oral Presentation

Synthesizing paleoenvironmental proxy records is essential in understanding whether climate and/or anthropogenic forces drive landscape-level change. In this paper, we compare independent climate records derived from tree-rings against sub-centennial sedimentary pollen and charcoal records from Sequoia National Forest, California to examine the impacts Native American burning practices had on forest composition. We hypothesize that during cool, wet periods favoring shade-tolerant species, Native American fire use preserved shade-intolerant taxa, producing pollen signals contrary to those expected by climate. We expect forest composition was climatically influenced during the Medieval Climate Anomaly, coinciding with decreased native populations in the Sierra Nevada. We aggregated local dendroclimatic records for the last 2000 years to the temporal scales of pollen and charcoal data for direct comparison between proxies. We find support for our hypotheses in comparison of these records. Shade-intolerant taxa are retained at higher levels than climatically expected during cool, wet periods coinciding with increased Native American populations, indicating an anthropogenic influence. Forest structure appears climatically-influenced during warm, dry periods, or periods of reduced native populations. We propose that Native American fire use can be evident in the paleoenvironmental record, and that such records should be interpreted both with climatic and anthropogenic factors in mind.

Klockow, Paul

Paul Klockow is a Graduate Research Assistant at Texas A&M University. He is currently pursuing a Ph.D. focusing on understanding deadwood and associated decomposition processes in Texas. He possesses a B.S. degree from Purdue University in Agricultural and Biological Engineering, with a focus in soil and water engineering, as well as a M.S. degree from the University of Minnesota in Natural Resources Science and Management, with a focus in silviculture and applied ecology. Paul's past work in the Lakes States region informed local bioenergy harvest guidelines by providing key recommendations for biomass retention following harvest.

Modeling surface fuel loading from standing dead trees following a major drought in east and central Texas, USA.

Student Poster Presentation

Major disturbances (e.g., drought, insect outbreaks, wind events) that cause tree mortality can greatly increase the available deadwood and surface fuels in forested areas, potentially affecting future fire intensity and behavior. Connecting the disturbance event to fuel loads requires a model quantifying the rate at which standing dead trees (snags) break apart and transition to surface fuels. Many factors, including climate, decomposer community structure, and tree physical characteristics can affect snag decomposition and, subsequently, the rate at which surface fuels accumulate following tree mortality. This study focuses on developing an accurate model for quantifying the rate at which snags contribute to the pool of surface fuels over time by measuring a suite of biophysical properties across east and central Texas, USA. Light Detection and Ranging (LiDAR) remote sensing techniques will provide accurate measures of changes in snag volumes and height over time. Coupled with snag diameter at breast height (DBH), wood density, species, temperature, and humidity, these factors will contribute to unique models determining the rate at which snags physically degrade and transition to surface fuels. Model estimates could have wide applicably to fire managers by providing detailed estimates of fuel loads over time and potential fire intensity following disturbance.

Knapp, Eric

Eric Knapp, Research Ecologist, USDA Forest Service, Pacific Southwest Research Station. Dr Knapp has been conducing research on prescribed fire, fuels management, and fire/silviculture relationships in forested ecosystems of California for over 14 years.

Restoring forest heterogeneity with mechanical thinning and/or prescribed fire – early results from the Variable Density Thinning study, central Sierra Nevada, CA

Oral Presentation

Historical forests shaped by fire were extremely variable, resilient, and biodiverse, suggesting that managing for multiple resources may benefit from restoring forest hetergeneity. Twenty four four-ha units were either mechanically thinned using a prescription designed to create structural variability based on the spatial arrangement of trees in historical forests , thinned with a standard prescription of evenly spacing crowns of individual trees, or left unthinned. Half of the units were followed with a prescribed burn. Vegetation data were collected both one year post-thinning and one year post-burning. Mechanical thinning removed 77% of trees and by selecting pines over fir and cedar, restored the relative species composition close to what it was in 1929. Prescribed fire alone killed only 5% of trees and did not alter the species composition of unthinned units. Understory shrubs, which are currently underrepresented in dense forest, responded positively to both thinning and prescribed fire treatments, with the combined treatments having the strongest effect. In addition, a higher percentage of herbaceous species flowered following the combined treatments. However, none of the variables analyzed so far differed between the variable and even thin treatments. Benefits of variable density thinning may require more time to manifest and other factors than those measured here may ultimately be more sensitive to the spatial arrangement of trees.

Kneifel, Rebekah

Rebekah Kneifel is an archaeological laboratory technician at the Missoula Fire Sciences Lab who co-conducts thermal experiments for a Joint Fire Sciences Program-funded project called ArcBurn. Rebekah has recently graduated from the University of Montana with an M.A. in Archaeology and wrote her Master's thesis on ArcBurn's radiant heat tests to ceramic artifacts. This thesis used experimental results to propose a basic preservation guide format, from which a more comprehensive guide could later be developed.

Developing Fuel Treatment Guidelines for Reducing Wildfire Damages to Cultural Resources in the American Southwest

Oral Presentation

Archaeological assemblages and features in the American Southwest have long been subjected to periodic wildfires. Over the last 150 years, southwestern wildfires have shifted to become low-frequency, high-severity regimes and thus, cultural resources exposed to modern wildfires are likely to become more damaged than in the past. Thermal alterations such as color change, spalling, cracking, fracturing, and more have been observed on the four main artifact types (masonry stone, obsidian, ceramics, and chert) following wildfires and prescribed burns. Such changes can be significant because artifacts provide important temporal context and social information, and when damaged, these clues to the past can be lost. Due to increasing threats to cultural artifacts, the Joint Fire Science Program funded a project, called ArcBurn, to test American Southwest artifacts in laboratory-simulated fire types (crown, surface, and ground). Results from this systematic testing can be used to anticipate cultural information loss thresholds in quantified fire doses. These results can then be influential in developing fuel treatments decisions near archaeological sites in the American Southwest to mitigate risk of moderate to severe fire effects to cultural resources.

Kobziar, Leda

Before joining the Natural Resources and Society Department of the University of Idaho, Leda Kobziar earned her PhD in Forest Science in 2006 at the University of California at Berkeley, and worked with the University of Florida's School of Forest Resources and Conservation (SFRC) from 2006-2015. Dr. Kobziar has served as the Principal Investigator for multiple USDA Forest Service grants and six Joint Fire Science Program projects, including the regional fire science knowledge exchange, the Southern Fire Exchange. Her work focuses on the efficacy of fuels reduction and prescribed burning treatments for wildfire mitigation and ecological forest restoration, soil carbon respiration and plant community response to fire, and dendrochronology. Research collaborators include the USDA Forest Service, the US Fish and Wildlife Service, the National Park Service, state forest agencies, and others. She is actively engaged in promoting support and increasing understanding of fire's role in the maintenance of US forests through her activities as a Certified Prescribed Burn Manager, on the Board of Directors of the Association for Fire Ecology, and as Associate Editor of Fire Ecology. She teaches undergraduate and graduate level courses in fire science, management, forestry, and restoration, and helps teach NWCG and state prescribed burning certification courses.

Can we restore resilient savanna plant communities in the modern landscape?

Poster Presentation

Although fuel treatments are known to have beneficial effects on understory structural parameters and overall plant diversity in fire-dependent pine savannas, it appears that certain types of plants important to ecosystem function may be chronically underrepresented on restored sites. For example, legumes are of particular importance to wildlife both directly (as a protein-rich food source) and indirectly (by replacing N lost to volatilization by fire), but they are among the functional groups most likely to be depauperate on restored sites. Few studies have isolated and examined the functional group composition of restored longleaf pine savanna understories, and those that have addressed these parameters have been experimental studies at a single location. The proposed project offers a new perspective by surveying plant communities in numerous fire-maintained stands across a wider geographic area. We are sampling understory plant communities on approximately 40 sites in Florida and Georgia, in order to determine how fire history, fuel treatments, individual species characteristics, and landscape-level attributes interact to influence understory functional group composition. The results are intended to help land managers better target funds to meet restoration goals such as wildlife habitat improvement and ecosystem resilience.

Kramer, Heather

Anu Kramer is a PhD Candidate at UC Berkeley's department of Environmental Science, Policy, and Management. She is also an employee of Deer Creek Resources. Anu is interested in methods of making LiDAR more accessible and useful for land managers. Her focus is on developing methods for quantifying ladder fuels at the landscape scale.

Estimating ladder fuels: a new approach by land and by air

Oral Presentation

Vegetation structure in forests that historically experienced frequent fire has been altered considerably by fire suppression and past harvesting. Of the structural changes that have taken place, the widespread increase in ladder fuels, which allow fire to transition from the forest floor into overstory tree crowns, is a major concern. This buildup of ladder fuels has contributed to the uncharacteristic fire patterns that are prevalent today. Furthermore, this overabundance of ladder fuels makes it difficult to re-introduce more natural fire to these systems. Despite their importance methods for quantifying ladder fuels are limited and imprecise. LiDAR (Light Detection and Ranging) is a form of active remote sensing that is able to estimate many aspects of forest structure across a landscape. This study investigates a new method for quantifying ladder fuel density in the field using photographs of the understory vegetation and a scale "banner." We investigate methods of estimating fuel density based on these photos, and test whether this value can be predicted by aerial LiDAR data. Data were collected in the Klamath River Basin of Northern California during the summer of 2015, so this presentation will focus on the question, our methods, and our preliminary results.

Kramp, Brendan

Brendan Kramp is Director of Regional Business Development, US and Canada, at Insight Robotics. With a strong commitment to social innovation and environmental conservation, Brendan is responsible for building strategic partnerships and helping customers in agriculture and forestry safeguard natural resources and infrastructure with intelligent threat detection. Prior to Insight Robotics, Brendan held several roles in fundraising, partnership development and business development for international institutions in the US, UK and Europe, including academic institutions, international conservation organizations, and an international media organization. Brendan holds an undergraduate degree from Brown University and an MBA from HEC Paris.

Protection by Detection: How Early Wildfire Detection Technology Reduces Economic, Natural and Human Devastation

Oral Presentation

The economic, social and human costs of wildfire are staggering and getting worse. In the US, annual suppression costs alone have hit nearly US$4.7 billion annually for federal, state, and local governments. With the costs of wildfire suppression rising so quickly, governments regularly spend significantly more than their budgets allow, often borrowing from funding intended for fire prevention. Research shows that each dollar spent on wildfire prevention can save several dollars in wildfire suppression, yet prevention continues to be underfunded. Not all fires can be prevented, and the little discussed step between prevention and suppression is detection. Early detection is crucial to effective fire suppression. The larger a fire grows before it is detected, the more expensive it is to suppress the fire. Fires allowed to grow beyond a certain size can't be fought at all in some cases. The often overlooked detection stage is seeing a technology revolution that is making a difference. We will introduce a new cost-effective automated thermal sensor technology that can help wildfire management personnel detect, map and monitor fires early before they turn into disasters. We will also share the system's performance in various tests and installations in forests around the world.

Kreye, Jesse

Jesse Kreye is a postdoctoral research associate at the Forest and Wildlife Research Center at Mississippi State University. His experience in fire has spanned several agencies and institutions including the US Navy, the Minnesota Department of Natural Resources, the US Forest Service in California, Humboldt State University, and the University of Florida.

Plant community response to mastication fuels treatments: a review of current knowledge

Oral Presentation

Mastication is a common fuels treatment applied to forests and shrublands. In spite of widespread adoption, it is unclear how mastication impacts the plant communities where it is employed. We review studies conducted across several ecosystems that examine how mastication treatments influence plant community response. Field-scale experiments and in situ studies highlight that vegetation responses vary widely across the many sites where mastication has occurred. Reduced tree density with little impact to basal area is common, since small-diameter trees are targeted, and shifts in species composition typify fire-excluded sites where a midstory of fire-sensitive trees had established. Shrub response differs widely across sites, with resprouting capacity being an important factor. Following mastication, grasses and forbs increase in some sites, however rapid shrub recovery or heavy masticated surface debris may limit herbaceous response. Grasses often respond more readily than forbs, even where forbs dominate belowground seedbanks. In cases where mastication was followed by prescribed fire, increased herbaceous response was common, as were increases in non-native invasive plants in some locations. Pre-treatment vegetation conditions and plant life-history strategies are likely important for understanding how plant communities will respond to mastication across the diverse range of sites in which treatments are being applied.

Kreye, Jesse

Jesse Kreye is a postdoctoral research associate at the Forest and Wildlife Research Center at Mississippi State University. His experience in fire has spanned several agencies and institutions including the US Navy, the Minnesota Department of Natural Resources, the US Forest Service in California, Humboldt State University, and the University of Florida.

Masticated fuels and how they burn: a review of early findings

Oral Presentation

Mastication is an increasingly common fuels treatment that redistributes "ladder" fuels to the forest floor to reduce vertical fuel continuity, crown fire potential, and fireline intensity. Recent fires in masticated fuels have behaved in unexpected and contradictory ways, likely because the shredded, compact fuel created when trees and shrubs are masticated contains irregularly shaped pieces in mixtures and bulk densities that contrast with other woody fuel models. We review fuels characteristics and fire behavior in masticated fuels across the United States. With insights from the few laboratory and field burning experiments conducted, we highlight the variation likely to occur across different ecosystems in which these treatments are being widely implemented. Although fireline intensity is typically low, masticated debris has a propensity to flame and smolder for long durations. Fuel variability and vegetation response will influence whether or not treatments reduce long-term fire hazard. We identify key science needs that will better elucidate fire behavior and effects in these treatments. With mastication widely applied in an expanding wildland–urban interface it is crucial to understand how such fuels burn. What we learn about combustion in these fuels will inform effective fuels management in these and other mixed fuels.

The impact of fuelbed aging on laboratory fire behaviour in masticated woody fuels

Poster Presentation

Mastication is an increasingly common fuels treatment that diminishes fireline intensity, crown fire potential, and disrupts vertical continuity via shredding small trees and shrubs. Laboratory and field-scale studies have examined how masticated fuels burn, highlighting the potential efficacy of mastication as a fire-mitigation tool, but also the potential for negative ecological consequences when compact fuels burn for long durations. Because of the impediments to prescribed fire use in many western fuels treatments, mastication is often a stand-alone treatment. We examined how fuelbed aging influenced burning behavior through laboratory experiments. Using fuels collected from sites in northwestern California and southwestern Oregon that spanned 2 to 16 years since treatment, we observed that masticated debris burned with lower intensity as time-since-treatment increased. Fuel consumption, however, did not differ with age. The oldest fuels smoldered for longer durations than recently masticated fuels. Although fire intensity decreased with fuel age, sites where mastication produces heavy fuel loads and where decomposition rates are slow, e.g. western dry climates, masticated debris may still pose a hazard several years after treatment.

Kreye, Melissa

Melissa M. Kreye is a Post-Doctoral Associate at the University of Florida in the School of Forest Resources and Conservation in Gainesville, Florida, USA. She holds a Ph.D. in Forest Resources and Conservation from the University of Florida and a M.S. and B.S. degree in Fisheries Biology from Humboldt State University in Arcata, California, USA. Melissa has published in several highly ranked journals on topics such as public values and landowner preferences towards rural land conservation, water resource protection and imperiled species protection. Melissa has also received multiple awards for her contributions to extension and outreach within the state of Florida.

Promoting Prescribed Burning and Wildlife Habitat Conservation on Private Forestlands through Reduced Regulation in Florida

Poster Presentation

It is well understood that frequent prescribed fire in southeastern pine forests produces open canopy structure and promotes a diverse understory community beneficial to wildlife and imperiled species. Unfortunately, forest landowners who's objectives are to manage for wildlife habitat and timber are often concerned about the obligations and permitting costs associated with the Endangered Species Act. The costs of management practices that promote desired habitat conditions are also of primary importance. The state wildlife agency in Florida recently compiled a list of voluntary Wildlife Best Management Practices (WBMPs), based on existing silvicultural BMPs, to minimize the potential impact that silvicultural activities may have on protected species. Landowners who have demonstrated WBMP compliance are not required to obtain a permit authorizing the incidental take of State Imperiled Species associated with their operations. To understand how a reduction in permitting costs and risk of regulatory penalties impacts landowner attitudes towards managing habitat for imperiled species we interviewed non-industrial and industrial private forest landowners in Florida using qualitative research methods. We found that that the decision to use prescribing burning to promote wildlife habitat to be dependent on the amount of income recovered and the priority landowners' place on different land use objectives.

Kuhar, Kim

Kim Kuhar/Forest Fuels Specialist. Kim has developed a forest level monitoring program for the last 6 years which focuses on site characteristics post fuels treatment. Dan Ray/District Fuels Specialist. Dan has implemented multiple grassland restoration projects encompassing several thousand acres, with success in reducing encroachment of pinyon-juniper species.

Management considerations in the use of heavy equipment in restoring grassland ecosystems.

Oral Presentation

This presentation compares similarities and differences in the use of heavy equipment using mastication and dozer push to reduce pinyon-juniper encroachment in grassland ecosystems. In some cases Rx fire and wildfire may have occurred in the project area. Characteristics which are used are plant biodiversity, dominant species, and ground cover. Characteristics are measured using a frequency intercept method developed by Texas Tech. The presentation incorporates history of the treatments, findings from monitoring method, and management considerations. The presentation will be given by Kim Kuhar (Forest Fuels Specialist), and Dan Ray (District Fuels Specialist) - Lincoln National Forest.

Kumar, Jitendra

Jitendra (Jitu) Kumar is a Research Staff in Environmental Sciences Division at Department of Energy's Oak Ridge National Laboratory. His research focuses on large scale data analytics for climate and ecological problems using state-of-the-art high performance computing technologies and resources.

Mining historical MODIS Hotspots archive to characterize global fire regimes

Oral Presentation

Fire regimes are important for understanding the effect of changing climate on fire patterns and their impacts on ecosystem and carbon cycle. Changing climate is expected to have impact on spatial pattern, frequency and severity of fires. Fire regimes can provide a sensitive indicator of changes to the landscape due to climate and human activity. Fire regimes characterizes and captures extent, seasonality, frequency and intensity of fires in the landscape. Fires that occur outside the distribution of one or more aspects of a fire regime may affect ecosystem resilience. However, global scale data related to these varied aspects of fire regimes are highly inconsistent due to incomplete or inconsistent reporting. In this study, we derive a globally applicable approach to characterizing similar fire regimes using long geophysical time series, namely MODIS hotspots since 2000. A series of attributes were derived using rich time series data sets. k-means non-hierarchical clustering was used to generate empirically based groups that minimized within-cluster variability creating statistically defined global fire regimes. The empirical data-mining approach used on this relatively uniform data source allows the region structures to emerge from the data themselves without any preconceptions. Fire regimes can help us interpret the similarities and differences among places and identify where large infrequent mega-fires are likely to occur ahead of time.

Kurth, Laurie

see bios in the abstract

Panel Session – Managing Fire – Understanding Perspectives

Oral Presentation

Numerous factors influence when, where and how to manage wildfire. Key considerations include direct and indirect effects on adjacent lands, nearby communities, economies, residents, and the general public. Opportunities to manage wildfire for resource benefit can be increased in areas where communities have prepared for and are adapted to live with fire. Yet even with preparation, public perception and support can be swayed during an actual fire, particularly when the fire is very active and within sight, is in close proximity and when there are smoke impacts. Through the eyes of diverse experiences, this panel will discuss how to gain support for managing fire for resource benefits, identify concerns for which preplanned mitigation may be beneficial, and explore opportunities for increasing collaboration leading to increased management of healthy, resilient ecosystems and safe communities. Panel members include: Mark Mitchell, Owner, Critcher Ranch, Texas. Mark will provide a rancher's perspective on keeping fire on the landscape and the particular challenges they face and his thoughts on burning perfectly good grass that his cows could otherwise eat. Tim Ingalsbee, Executive Director, Firefighters United for Safety, Ethics, and Ecology (FUSEE). Inevitably for socioeconomic and ecological necessities, the war on wildfire paradigm of fighting fire will end, and a future fire-adapted society will focus on managing wildland fires to restore ecosystem resilience and community sustainability in fire-prone landscapes. FUSEE will present its perspective on the paradigm shift that is currently unfolding in the wildland fire community that is bringing this vision of future ecological fire management closer to reality Dave Campbell, District Ranger (retired) USFS, Hamilton, Montana. Dave will provide the perspective of frequently making decisions to manage fire for resource benefits in the proximity of a community that is often impact by smoke and threat of fire. He will also share his perspective as a resident of that community. Pete Lahm, Air Quality Program Manager, USFS, Washington, DC. Pete fully understands the tension brought to the table when there is smoke in the air. He will provide the perspective of smoke management considerations, how to mitigate or minimize smoke exposure, and how to incorporate smoke considerations into decisions to manage wildfire.

Lafon, Charles

Charles Lafon is a Professor of Geography at Texas A&M University. A native of the Appalachian Mountains of Virginia, he has worked with collaborators, students, and resource managers to establish a network of fire-scar sites across the Appalachian Mountains of Virginia, Tennessee, and North Carolina. This fire history research demonstrates that fires were common in the Appalachian Mountains from before European settlement until the advent of fire suppression. These studies have been published in several journals, including the Journal of Biogeography, Ecological Applications, Forest Ecology and Management, Applied Vegetation Science, and Physical Geography.

Fire history research and its application to fire management in the Appalachian Mountains

Oral Presentation

We have developed a fire history network based on fire-scarred trees from the Appalachian Mountains. Each fire history site yielded a dense collection of fire-scarred cross-sections that permitted estimates of past fire intervals and seasonality through multiple land-use periods, back to the seventeenth or eighteenth century, depending on the study site. The various estimates of mean fire interval reveal that fires typically recurred every 2¬–13 years, approximately, before fire suppression began in the early 1900s, after which burning virtually ceased. Frequent burning promoted xerophytic trees, especially pine and oak, according to analyses of tree age structure; but when burning ceased, mesophytic species rapidly encroached. The research was conducted in consultation with fire managers, who have been using the findings to plan fire and fuels management, especially prescribed burning. We have regularly updated fire managers about our findings by sharing publications, emailing synopses directly to managers, and presenting at Fire Learning Network meetings. We have participated in the development of the JFSP-funded Consortium of Fire Managers and Scientists (CAFMS), through which we are currently developing a written synthesis and planning a workshop to communicate with fire managers.

Lahm, Peter

Pete Lahm is the Air Resource Specialist for Forest Service, Fire and Aviation Management based at headquarters in Washington, DC. He leads the NWCG Smoke Committee and manages the Wildland Fire Air Quality Response Program, an interagency effort which addresses smoke from wildland fires through emergency monitoring, deployment of technical specialists called Air Resource Advisors to fires and utilizes the latest smoke dispersion science to predict and warn of smoke impacts on the public, communities and fire personnel.

Wildfire, Prescribed Fire and the Clean Air Act: the Latest Challenges and Opportunities

Oral Presentation

The United States trends are clear: more wildfire and less prescribed fire coupled with tighter air quality standards and greater challenges in meeting burn and smoke prescriptions. Tightening air quality regulations along with an ever-expanding array of concern and potential emission reduction requirements for Green House Gases and short-lived climate forcers such as ozone, methane and black carbon. There are significant air quality regulations to be released by EPA which will affect the way land is managed with fire in the US. Understanding the national and state air quality regulatory landscape is critical to maintaining progressive use of fire. The latest revisions of the National Ambient Air Quality Standards for ozone will impact fire use by federal to private land managers. EPA has clearly indicated in several recent rules that fire emissions are becoming more important to the state of national air quality. As standards tighten, based on recent medical science, EPA is showing they are also clearly understanding that wildland fire will be part of the landscape. There has been key statements and provisions in recent rules which recognizes how prescribed fire, some wildfire and fuels management can be used as “reasonable available control measures” for addressing wildfire risk. Additionally, EPA has recognized the value of collaborative efforts such as prescribed fire councils to address areas with air quality issues. There has been EPA commitment to improving the capability of the 2007 Exceptional Events Rule to facilitate demonstrations which have contributions to air quality standard exceedances that have been affected by wildfire or prescribed fire. The wildland fire community needs to be aware of the upcoming air quality challenges and opportunities in these rules and effects on the use of wildfire and prescribed fire in a changing climate.

Smoke, Fire and Air: NWCG Smoke Committee Latest Activity

Poster Presentation

The National Wildfire Coordinating Group's Smoke Committee (SmoC) provides interagency leadership, coordination and integration of air resource and wildland fire management. Air quality is critical to human health and fire is a critical disturbance process in wildland ecosystems. SmoC promotes management and utilization of wildland fire while addressing smoke impacts, for the health and safety of the public and fire personnel. Members include federal, state and private land management and conservation agencies with state and local air quality agencies. SmoC has three subcommittees with projects such as the Smoke Management Guide revision, emission factor implementation for land managers and air quality applications, and use of visual range to inform behavior when smoke measurements are not available. SmoC partners with the University of Idaho and Fire Research and Management Exchange System (FRAMES) developing a website (www.frames.gov/smoke), which has interactive training on "Smoke Management and Air Quality for Land Managers" that reflects the latest in air quality regulations. SmoC products include the Wildland Fire Personnel Smoke Exposure Guidebook and the Transportation and Smoke Workbook. Activities include sharing the latest regulations which affect fire use, coordination during wildfire season on smoke and deployment of Air Resource Advisors and smoke monitoring instruments.

Laris, Paul

Paul Laris is Professor and Chair of Geography and Director of Environmental Science at California State University, Long Beach. He is author of numerous publications on African savanna fires. His research has been funded by NASA, the National Science Foundation and the National Geographic Society.

What is Early and what is Late?: The West African fire experiments and what the can (and can't) tell us about savanna fires.

Oral Presentation

Seventy years ago Aubréville devised a field experiment in West Africa to study the impacts of fire on savanna trees. The project persisted for 60 years and has been highly influential. Savanna ecological theories have incorporated the findings from Aubréville's experiment and others in the form of two principles: i) fire regime determines vegetation cover; and ii) late fires are most damaging to juvenile trees. It is now abundantly clear, however, that the dates chosen by Aubréville do not reflect the burning practices of West Africans. Our findings indicate that the majority of fires occur at a time of year that does not conform to those dates chosen by those conducting experiments which represent the extreme ends of the fire season. As such, we argue that the results of the experiments tell us very little about the actual impacts of anthropogenic fires. The purpose of this article is to: 1) critically review the results of the burning experiments; 2) to evaluate their limitations based on human practices; and 3) to explore the hypothesis that time of day, fire direction and grass species—more so than fire timing—determine the impacts of savanna fires on tree regeneration and growth.

Larson, Heather

Heather Larson is a graduate student pursuing a Master's degree in Science at the University of Florida. She is an active member of SAFE and has helped conduct all of the prescribed burns she has studied.

Don't forget the little guys: how smoke transports microbes and what it might mean for surrounding forests.

Oral Presentation

Microbes can be transported great distances in smoke plumes, resulting in both beneficial (e.g. mycorrhizae, nitrogen-fixing bacteria) and harmful (e.g. fungal pathogens) effects on plant communities. This study explores how prescribed fires transport microbes via smoke, and examines how flaming and smoldering combustion evoke the transport of microbes differently. Sampling was conducted during multiple prescribed fires in pine dominated upland forests in Florida. Microbes were sampled from the smoke produced by understory and downed woody debris combustion using malt extract agar petri plates, and cultivated using standard laboratory techniques. DNA extraction, PCR, and DNA analysis of the most ubiquitous microbes were conducted. Eighty different microbial species grew on the plates and of these, 12 were identified to species, including Epicoccum nigrum, a known fungal endophyte used as a biocontrol agent. Abundance and diversity were both influenced by distance from smoke source. Given that over five million acres of similar forest is burned in the southern region each year, these findings have implications for local, regional, and perhaps global understanding of microbial diversity and transport. Land managers interested in restoration and conservation can use the information to make informed decisions about how burning may influence neighboring ecosystems.

Lata, Mary

Dr. Lata is currently the Fire Ecologist on the core team for the Four Forest Restoration Initiative; the largest restoration project ever undertaken by a land management agency in the United States. Before accepting a job as a Fire Ecologist with the US Forest Service in 2002, she worked for the National Park Service (South Dakota and New Mexico) and The Nature Conservancy (Midwest). She completed her Ph.D. at the University of Iowa the thermal dynamics of grassfires, though her current fascination is with smoke, theorizing that species that have adapted to frequent fire will also be adapted to frequent smoke.

The Effects of Soil Moisture on Fire Characteristics in Experimental and Prescribed Fires in Mixed and Tallgrass Prairie

Oral Presentation

Soil moisture is not often considered in prescribed fire prescriptions. In order to identify the fire effects potentially affected by soil moisture, we evaluated the thermal dynamics of 15 fires. Dataloggers and thermocouples were used record temperatures ranging from -5 cm to 3 m. In nine prescribed fires, the maximum temperature was 875°C (1607°F) at 75 cm. Soil moisture was manipulated in six experimental fires, resulting in a maximum temperature of 920°C (1688°F) at 10 cm. The greatest temperature difference between dry and saturated substrate was at the surface, where dry substrate averaged 130°C (266°F) higher than saturated. Average temperatures at -1 cm differed by 33°C (91°F). Surface residence times at 60°C in dry substrate averaged ~7 minutes; about 3 times longer than saturated. Temperatures affecting germination of some seeds occurred at all heights and depths, while temperatures lethal to some seeds occurred only at and above the surface. Overall, higher soil moisture correlated with higher temperatures, shorter residence times, and higher relative humidity and fuel moistures near the surface. The high correlations between soil moisture, temperatures, and residence times documented in this study suggest that soil moisture may be a useful predictive tool for producing the desired fire effects in mixed and tallgrass prairie.

Effects of pine needle smoke on sprouting of species native to ponderosa pine in Northern Arizona, USA

Oral Presentation

Previous studies have found that smoke enhanced germination in some species of forbs native to forests dominated by ponderosa pine (Pinus ponderosa). Ponderosa pine is well adapted to frequent fire, and it was assumed that species that evolved in the vicinity of frequent fire would also need to be adapted to frequent smoke in some manner. Species tested included Blue Flax (Linum lewsii),Upright Blue Beardtongue (Penstemon virgatus),Golden Pea (Thermopsis pinetorum), Large Beardtongue (Penstemon grandiflora), Scarlett Gilia (Ipomea aggregata), and Beardlip Penstemon (Penstemon barbatus). All combinations of smoked seeds and smoked soil were tested by tracking sprouts daily for 8 weeks after planting. Species responded differently, with some showing a significant response, and others showing no response. In 2014, LILE had the most definite response, with seed germination in smoked treatments ranging from 23% to 41%, and just 16% for the control. Sprouting time was also affected, with species in smoked treatments sprouting up to two weeks earlier than the control. Results from the first year of data suggest that the indirect effects of smoke on the seed (i.e. smoked soil) may have a positive effect on some species. Results presented at the conference will include data from the 2015 planting.

Lauer, Justin

Justin Lauer is a fire manager for the Oregon Department of Forestry and also a graduate student at the University of Idaho in the Department of Forest, Rangeland, and Fire Sciences. This research is part of his MS thesis research.

Reburns and Fire-on-Fire Perimeter Interactions 1900-2013

Student Poster Presentation

Fire-on-fire interactions, where fires encounter the perimeter and burned area of a previous fire, will increase as large fires become more frequent across the western US. Where fires are limited in size or severity by previous fires, this could enable safer firefighting, better land and fire management, and lower fire suppression costs. We analyzed fire perimeters recorded 1900 to 2013 for 9.7 million forested ha in the U.S. northern Rockies to understand which variables jointly influence these interactions and to determine if previous fires are limiting extent of subsequent fires. We characterized fire-on-fire interactions as the distance from random points within the buffer of a previous fire to the nearest perimeter of a subsequent fire. We analyzed fire-on-fire interactions by dry vs. cold vs. mesic forests, wilderness vs. non-wilderness status, elevation, aspect, and for early (1900-1934), middle (1935-1973), or late (1974-2013) fire management periods, during regional fire years, and with increasing time since previous fire. Less than 2% of the total fire atlas area burned more than once. Fires overlapped more during regional fire years, in wilderness, early and late, and after 16 years, but other variables were less influential. Fire-on-fire interactions were similar for cold and dry forests.

Lauvaux, Catherine

Catherine Airey Lauvaux is PhD student in the Geography Department at Penn State University.

Fire history and vegetation change in a mixed severity regime Douglas-fir forest-sagebrush-grassland landscape in the northern Rocky Mountains

Oral Presentation

Naturally functioning forest ecosystems have been called gemstones of the Rocky Mountain landscape. Since Euro-American settlement, these forests have been altered by logging, livestock grazing , a century of fire suppression, recent extreme wildfires, and ongoing climate change. Although critical to efforts to restore and maintain healthy forests, remaining uncertainty about pre-settlement vegetation composition and structure and historical fire regime, particularly in mixed severity fire regimes and in Rocky Mountain pure Douglas-fir forests, has limited our understanding of the nature of the alteration. We used dendrochronological fire scar records, tree cores, and repeat aerial photography to investigate the characteristics, timing, and mechanisms of vegetation change in a Douglas-fir forest-sagebrush-grassland mosaic in the Soldier Mountains of Idaho. Preliminary results indicate that fires occurred every 15 years with more widespread fires occurring in very dry years every three to four decades. Expansion of trees into sagebrush is primarily a post fire suppression phenomenon that is ongoing. This work can help shape decision -making geared towards maintaining the long-term stability of mixed severity fire regime ecosystems.

Lederer, Natalia

Natalia Lederer is a forest engineer graduated at the University of Patagonia in 2013. At present, she is PhD student in Biology at the University of Córdoba, Argentina. Her dissertation research deals with the effects of different treatments (prescribed burning, mastication, a combination of both, and untreated control) for reducing understory residues left by pruning and thinning activities within conifer afforestation stands of Patagonia in Argentina. The study will also determine the CO2 emitted by the use of each reduction technique, and how they affect some soil properties.

Effects of different techniques of treating pruning and thinning residues on some soil properties of afforestations of Patagonia located in a precipitation gradient: preliminary results.

Student Poster Presentation

Conifer afforestation is incipient in the forest-steppe ecotone of Andean Patagonia, Argentina. Of about 800 thousand ha with good afforestation potential, only 90 thousand ha are already planted. Most of them lack of sivicultural practices such as pruning and thinning, and when they are performed, residues are left on site untreated. This study was aimed at a) quantifying these residues in three pruned and thinned stands located in a precipitation gradient comprising humid, mesic and dry sites; and b) determining the effects that three techniques of reducing residues, namely 1) prescribed burning, 2) mastication, 3) mastication plus prescribed burning, and 4) control, have on some soil properties. Before treatment, fuel load of residues (coarse, medium, and fine) was similar on the three sites. Along the season, moisture of surface organic matter, and at all depths into the soil profile, was higher in the humid site, and steadily diminished toward mesic and xeric sites. Treatments also affected surface organic matter moisture, being significantly higher in the control as compared to the other treatments. Soil water, instead, was higher at all profiles in the burning treatment as compared to the others. However, more data should be necessary to confirm these preliminary results.

Lee, Danny

Danny C. Lee, Ph.D., Director, Eastern Forest Environmental Threat Assessment Center (EFETAC), USDA Forest Service. Dr. Lee has served as the EFETAC Director since its inception in 2005, where he is responsible for a multidisciplinary unit charged with predicting, detecting, and assessing environmental threats to forests and other landscapes throughout the USA. His personal expertise is in the application of quantitative analyses and risk assessment to broad-scale, interdisciplinary planning and assessment.

Big problems demand big data: Promise and pitfalls of using big data to cohesively manage wildland fire.

Oral Presentation

The daunting challenges of contemporary wildland fire management in the United States arise from the complex interactions of a broad and heterogeneous biophysical landscape enmeshed with a diverse and expanding human presence. Effective management requires understanding the interconnectedness of these systems across a range of spatial and temporal scales. While local understanding is essential for on-the-ground action, regional or national planning requires a broader, more integrated perspective across the whole. This perspective does not come from simply accumulating or aggregating finer scale information, but rather by posing questions uniquely relevant at broader scales. Recent advances in data-capture and analytical capacity improve our ability to assemble and analyze huge data sets, which promises more consistent, comprehensive, and integrated understanding across broad landscapes and discovery of new insights. Such data and techniques are not without problems; mundane issues of data quality and computational capacity compound a more basic challenge of how one makes sense of it all. Our recent experience conducting analyses in support of the National Cohesive Wildland Fire Management Strategy provide real-world examples of both promise and pitfalls of using big data to address big questions. Others in this session offer complementary perspectives on this challenging and emerging field.

Leis, Sherry

Sherry Leis is the Fire Science Program Leader at Missouri State University. She works to provide fire effects monitoring support to the National Park Services Heartland I&M Network. She also leads the Great Plains Fire Science Exchanges efforts to outreach fire science in the region. My interests lie in the investigation of disturbances such as fire and grazing on grassland communities of the Great Plains and Midwest. Sherry earned a MS in Rangeland Ecology and Management from Oklahoma State University and Bachelor Degrees in Anthropology and Environmental Biology from Beloit College, WI.

The heart of fire in the Great Plains: Private landscapes, prescribed burning, and collaborative fire communities

Oral Presentation

The processes for fire and grazing historically and presently shape the natural communities of the Great Plains. The role of human ignition dominates fire occurrence although natural ignitions occur. In today's highly fragmented landscape, private landownership dominates the region making land management approaches unique compared to public land regions. Our discussion will focus on grassland community change as the result of less frequent fire and landscape fragmentation and successful approaches to information outreach. Partners throughout the region have implemented a neighbor helping neighbor model for prescribed fire implementation. These local networks serve as hubs for fire training, information dissemination, and peer to peer support.

Lesser, Jacob

Jacob is a grad student at Western Washington University and a Research Associate at the Huxley Spatial Institute. At the institute, Jacob has helped develop many GIS and web applications for local, state and federal agencies and organizations to help disseminate pertinent geospatial data for public consumption.

Detecting fires: A Nationally Consistent Rule Based Approach

Oral Presentation

One of the continuing challenges in wildland fire management is maintaining accurate vegetation and fuel data of an adequate resolution on an ever changing landscape. The USGSs LANDFIRE program produces national, mid-level resolution datasets of fuel, vegetation, and fire regime data useful in the modeling of wildland fire behavior. One of the most effective and least expensive ways for maintaining the accuracy of these layers is to incorporate area updates by detecting landscape changes. While many algorithms exist for detecting change and disturbances, these algorithms are often tuned for a particular landscape and require very precise training data or rely heavily on scene statistics. This research looks at a method for detecting wildland fire across a broad array of landscapes using a collection of computer generated rules built from hundreds of thousands of points of training data. Accuracy of the research was assessed by comparing the models results to an aggregate database of historical fire records across the 11 western states.

Leverkus, Sonja

Sonja E.R. Leverkus is the Ecosystem Scientist and owner of Shifting Mosaics Consulting. She is a PhD candidate at Oklahoma State University in the pyric herbivory lab of Dr. Sam D. Fuhlendorf. Sonja is an AFE certified wildland fire practitioner and together with her colleagues in northern Canada, she uses prescribed fire across the boreal forest and rangelands to conserve biodiversity and endangered species. In the summer of 2015, Sonja was surrounded by a ring of fire in her home in Fort Nelson, BC where more than 200,000 hectares were burned by combined prescribed fire and wildland fire!

Pyric herbivory in Northern Canada: Where do the Wood bison roam?

Oral Presentation

The boreal forest of Northern Canada is a fire driven and maintained ecosystem. Many boreal species, such as Wood bison, have a strong interaction with fire. Wood bison were once widely dispersed across the region, but were extirpated from British Columbia in the early 1900's. The Government of BC reintroduced two herds in 1995 and 1999 to northern British Columbia. Wood bison exhibit pyric herbivory in their resource selection for recent time since disturbance across the landscape. Researchers, First Nations, Guide Outfitters and wildlife conservation associations have recently developed management regimes and have implemented them across the broad landscape of Northern BC.

Lewis, Sarah

Sarah Lewis is a Civil Engineer with the USDA Forest Service, Rocky Mountain Research Station, Air, Water and Aquatic Environments Science Program in Moscow, Idaho. Sarah specializes in spatial and remotely sensed analysis of post-fire mitigation treatments and assessing the impact of post-wildfire treatments on soil and vegetation recovery.

Assessing burn severity and recovery 10 years after wildfires in western Montana

Oral Presentation

Forest recovery after wildfire can take decades to return to pre-fire condition, depending on size, severity, and the resiliency of the forest ecosystem. We monitored vegetation recovery following three 2003 western Montana wildfires using scalable variables available from field and remote sensing data. Field data were collected immediately post-fire and one and ten years later. Airborne hyperspectral imagery (HSI) was collected in 2003, and satellite QuickBird imagery in 2007. Multiple endmember spectral mixture analysis (MESMA) was used to classify images and create cover maps of select post-fire ground components: char, soil, green and non-photosynthetic vegetation (NPV). Char and ash cover were indicative of high burn severity immediately after the fires, while char and green vegetation cover classified data into high and low severity after one growing season. Of all variables, char cover measured on the ground had the strongest correlations with the hyperspectral imagery. There was less than 5% green vegetation cover on the sites initially, but by 2013, green vegetation was the dominant cover on all sites (~60%) regardless of original burn severity classification. Dominant cover classes shifted from char and ash initially, to char and green vegetation after one year, and to green and NPV after 10 years.

Light, Marnie

Dr Marnie Light is an Honorary Senior Lecturer at the University of KwaZulu-Natal, with an academic affiliation to the Research Centre for Plant Growth and Development. She is also the Programme Manager of the Re-establishment Research Programme at the Institute for Commercial Forestry. Marnie has a broad interest in plant sciences, although her favourite area of interest relates to the phenomenon of smoke-stimulated seed germination. To date, Marnie has contributed towards 28 publications related to understanding the effects of smoke and smoke-derived compounds on seed germination and plant growth, and 18 publications on various plant science studies.

Ecological implications of the antagonistic interactions of smoke-derived butenolide compounds

Oral Presentation

It is now well established that smoke from burning vegetation is an important fire-related cue that plays a role in signalling germination of seeds in the soil seed bank following fire. Several highly active chemicals that are effective in promoting seed germination in many species have been identified from plant-derived smoke. The butenolide compound in smoke responsible for enhancing germination in many species has been identified as 3-methyl-2<i>H</i>-furo[2,3-<i>c</i>]pyran-2-one (karrikinolide, KAR₁). In contrast, a structurally-related butenolide, 3,4,5-trimethylfuran-2(5<i>H</i>)-one (trimethylbutenolide), also identified from smoke, has been shown to have inhibitory effects on germination and reduces the promotory effect of KAR₁ in some cases. The opposing action of these compounds has interesting ecological implications and it may be useful to understand how such interactions can affect the overall response of seeds in the soil seed bank to smoke. This presentation will provide an overview of some previous studies which illustrate this effect, and will also discuss the potential use of smoke-water as a tool for ecological restoration.

Contrasting germination responses to smoke-derived compounds by species from south-western Australia

Oral Presentation

Smoke-stimulated seed germination is a fascinating phenomenon that has received much interest, particularly relating to species found in mediterranean climate regions such as the Western Cape and Western Australia. More than 1300 plant species, representing 120 families from around the world, have now been tested for their germination response to smoke or smoke-infused water. Several compounds with germination activity have been identified from plant-derived smoke, including a group of compounds referred to as 106karrikins, and the cyanide-releasing molecule, glyceronitrile. Although karrikinolide has been shown to be one of the most important germination promoting compounds in smoke, as research on this topic has progressed it has become apparent that not all species respond to smoke compounds in the same way. This presentation will summarise some of the contrasting germination responses of various species from south-western Australia (<i>Anigozanthos</i> spp., <i>Blancoa canescens</i>, <i>Conostylis</i> spp., <i>Gyrostemon</i> spp., <i>Tersonia cyathiflora</i>) to smoke and different smoke-derived compounds. These examples, from the Gyrostemonaceae and Haemodoraceae families, will highlight the importance of understanding how seeds from different species in fire-prone regions respond to smoke, and the implications of this for fire management and biodiversity conservation of natural areas.

Investigating the effects of undercanopy burning on young-aged pine plantations in Mpumalanga, South Africa

Poster Presentation

In July 2007, devastating runaway fires damaged around 25,000 ha (~62,000 ac) of pine timber plantations in the Mpumalanga Highveld region in South Africa. Following this catastrophe, intensive forestry planting operations were carried out to re-establish these areas. Subsequently, there are now large areas of young-aged (6- to 7-year-old) pine plantations in the region. This presents a significant risk should a fire get into these areas, particularly under high fire danger index (FDI) conditions. These pine stands, mainly comprising <i>Pinus elliottii</i> (slash pine) or <i>Pinus patula</i> (spreading-leaved pine, Mexican weeping pine) have a highly flammable fuel layer in the understory, consisting of a mixture of old grass, pine needles and pruning slash/debris. While prescribed undercanopy burning can successfully be used to manage fire risk in older pine stands, it has not been used where the trees are younger. Thus, a pilot study consisting of two trials on 7-year-old trees (one in <i>P. elliottii</i> stand; one in <i>P. patula</i> stand), was implemented to investigate the feasibility of using undercanopy burning as a fire management tool to reduce the fuel load in these areas. Preliminary findings will be presented.

Limb, Ryan

Dr. Ryan Limb is an Assistant Professor in the Range Science program at North Dakota State University. His research focuses on restoring historic process on working landscapes to reduce exotic species and promote native species of concern. He is serves as an E-Extension Prescribed Fire team leader and Great Plains Fire Science Exchange board member. A recent study followed tallgrass plant communities through the eastern redcedar removal process to determine potential restoration opportunities and limitations.

Heterogeneity-based conservation strategies for Great Plains conservation: Implications for livestock production

Oral Presentation

Great Plains conservation efforts in are dependent on working landscapes with approximately 85% private ownership. Achieving economically optimum livestock production on rangelands can conflict with conservation strategies requiring lower stocking rates to maintain habitat. Combining the spatio-temporal interaction of fire and grazing (pyric-herbivory) is a conservation-based approach to management that increases rangeland biodiversity by creating heterogeneous vegetation structure and composition. However, livestock production under pyric-herbivory has not been reported. In both mixed-grass prairie and tallgrass prairie, we compared livestock production in pastures with traditional grazing management and conservation based management (pyric-herbivory applied through patch burning) at a moderate stocking rate. Stocker cattle weight gain, calf weight gain and cow body condition score did not differ ($p > 0.05$) between traditional and conservation based management at the tallgrass prairie site for the duration of the eight-year study. At the mixed-grass prairie site, stocker cattle gain did not differ in the first four years, but stocker cattle gained more ($p \leq 0.05$) on conservation based management and remained 27% greater for the duration of the eleven-year study. We conclude that pyric-herbivory is a conservation based rangeland management strategy that returns fire to the landscape without reduced stocking rate, deferment, or rest.

Lininger, Jay

Jay Lininger is a Senior Scientist with the Center for Biological Diversity. He consults on management of fire-adapted ecosystems throughout the western United States, including the Four Forest Restoration Initiative in Arizona. Jay is certified by the Association for Fire Ecology as a Wildland Fire Ecologist, and holds a M.S. from The University of Montana at Missoula.

Reference Conditions for Ecological Restoration of Fire-Adapted Conifer Forest, Kaibab Plateau, USA

Poster Presentation

Management objectives for dry conifer forest in the western United States emphasize restoration of ecosystem structure and composition adapted to wildland fire. Place-specific variation in climate, vegetation and management history influence natural disturbance patterns, and generalized reference conditions may be used to justify counterproductive management actions. The Kaibab Plateau exhibits unique environmental gradients meriting special attention in reference analysis to support objectives of climate adaptation, forest resilience and conservation of biological diversity.

Llamas-Casillas, Paulina

Paulina is a Ph.D. student in her first year in the School of Environmental and Forestry Sciences from the University of Washington. She is Mexican, and she obtained her Bachelor's degree and Master's degree from The Universidad de Guadalajara. She is interested in reconstruction of fire regimes.

Historical fire regime and land use in western México.

Oral Presentation

The fire history of conifer forests from the Sierra de Manantlán was described using dendrochronology methods, and its zonal and intra-zonal variations were characterized. We collected transversal sections for wildland fire frequency dating from six bioclimatic, topographic, and land use contrasting sites. The ring-width series covered 174 years (1837 - 2010). A composite mean fire interval for each locality varied between 5.1 and 12.4 years using all samples, whereas a variation with a 33% filter was between 5.0 and 18.3 years. Median interval values from a Weibull distribution were similar. Bottom-up controls influence strongly the fire frequency. Fire suppression activities, which are part of the management objectives, have been successful in some parts of the study area. Other activities such as prescribed burning, should be practiced since the last few years the management tendency has been directed towards a simplification of historic fire frequency. The evidence from this study indicates that since the beginning of the 20th century, human activities have modified fire regimes.

Lobby, Samuel

After serving 5 years on a Forest Service fire crew on the Black Hills National Forest, Sam began graduate school at the University of Kansas. Sam is currently pursuing a joint Master's program in Geography and Urban Planning with an emphasis on issues related to environmental politics and sustainability. His research is specifically focused on safety issues faced by federal wildland firefighters in the U.S. with the goal of contributing meaningful research to the wildland fire community.

Fired Up: The Geography of Federal Wildland Firefighter Safety in perspective

Oral Presentation

The wildland fire environment in the U.S. is becoming increasingly complex due to a century of fire suppression policies, development in wildland-urban interface areas, and an expected increase in fire activity due to climate change. As more attention is focused on wildfire management, the role of U.S. federal wildland firefighters is quickly changing. Unlike most structure fire departments, federal wildland firefighters do not have a standardized "medic" position on crews and are provided very little medical training, leaving them particularly vulnerable when responding to remote incidents. While there has been more focus on safety issues following several recent tragedy fires, there is still much more to be learned about firefighter safety. This research explores injury rates at various scales, particularly smaller incidents (Types 4-5), prescribed fires, and daily project work where planning for medical emergencies is more difficult. A detailed policy analysis using a "Science and Technology Studies" (STS) framework will attempt to uncover how firefighter safety knowledge is produced, applied, and circulated. As a former Forest Service firefighter, I intend to investigate major safety issues faced by firefighters with the goal of producing research that will increase the availability of medical resources and training to these individuals.

Loehman, Rachel

Rachel Loehman is a Research Landscape Ecologist with the US Geological Survey, Alaska Science Center. She holds a Bachelor's degree in Archaeology, a Master's degree in Biogeography, and a PhD in Ecosystems Ecology. Her work is focused on understanding of: complex, multi-scale ecological dynamics in natural and coupled human-natural systems; the role of disturbance (e.g., climate changes, wildfire, coastal erosion) in modifying landscapes; and development of biochronological datasets that provide a long-term view of ecological dynamics against which to assess the magnitude of 21st century change. Rachel works in coastal and interior Alaska, the inland Northwest, and the Southwestern US.

Fire and fire surrogates in cultural-ecological landscapes of the prehistoric Southwest

Oral Presentation

The prehistoric archaeological record in the American Southwest is extensive and includes large and small habitation structures, agricultural features, and other signatures of long and variably intensive landscape use. The southwest Jemez Mountains in central New Mexico have been utilized continuously for the past 2,000 years, and by circa 1300 CE were settled in a network of large village sites and fieldhouses that manifest as a significant human footprint on this fire-prone landscape. We hypothesize that prehistoric land use significantly influenced forest structure, fuel properties, ignitions, and thus landscape fire dynamics. Evidence from tree-rings, fire scars, and charcoal sediments suggests that for much of the period prior to ca. 1900 Jemez ponderosa pine forests sustained frequent, low-severity surface fires. However, during a period of dense occupation human activities may have significantly altered fire regimes, but without eroding the long-term persistence (resilience) of ponderosa pine forests. We use a coupled natural-human systems process model, informed by rich archaeological, ethnographic, and dendroarchaeological data sets, to assess the magnitude and importance of human influence on fire regimes and ecological resilience. Results highlight the complexity and extent of prehistoric engineered landscapes, and identify future human activities and climate conditions likely to trigger ecosystem instability.

Trial by fire: Do fuel treatments work to mitigate wildfire damages to cultural resources?

Oral Presentation

Fire and restoration activities have the potential to alter, disturb, or destroy cultural resources. In dry forests of the American Southwest interactions of climate change and management activities have altered fire regimes, exposing archaeological structures and artifacts and traditional cultural properties to more severe fire environments than occurred throughout prehistory. Fuel treatments can reduce fire severity, but their design and implementation is constrained by lack of information on the amount and duration of heating that results in damage to cultural resources. This information can be used to prioritize locations for archaeological protection actions and develop effective site-treatment plans. We report on in-situ monitoring of fire behavior and fire effects from prescribed and managed wildfires in 2013 and 2014 in the Jemez Mountains of central New Mexico. We installed above-ground fire behavior sensor packages (heat flux sensors and digital video recorders) and ground-based thermocouples that measured amount and duration of heating in a variety of fuels and topographic settings. Post-burn site and artifact assessments indicated varying degrees of damage to artifacts related to antecedent fuel loading, configuration, and condition, and fire behavior. Results suggest that current practices can be refined to improve protection and reduce impacts from fire and restoration activities.

Long, Donald

Donald Long is a fire ecologist at the Fire Sciences Laboratory of the Rocky Mountain Research Station in Missoula, MT. He works for the Fire Modeling Institute within the Fire, Fuels, and Smoke Program. He earned a B.S. degree in forest science from the University of Montana in 1981 and completed a master of science in forest resources at the University of Idaho in 1998. Don began his work at the Fire Sciences Laboratory in 1994. Don began working with the LANDFIRE Project in 2004 and is currently the Forest Service Science Lead for the LANDFIRE project.

Assessment of Requirements, Methods, and Applications of LANDFIRE Fire Modeling Products

Oral Presentation

Recently, the Fire Modeling Institute located at the Missoula Fire Lab held a series of "briefing and brainstorming" workshops pertaining to LANDFIRE Fire Modeling products. The objective of the workshops was to solicit science and research input on current LANDFIRE fire modeling products and help define future requirements for these products. Initial discussion focused on briefing workshop attendees on current LANDFIRE Fire Modeling product characteristics including definition of current product requirements, an overview of the current product creation process, and comparison of various versions these products. In addition, important applications of these products were highlighted and linked to related issues and feedback. The latter half of the workshop was spent brainstorming of potential future product requirements, improved and innovative product creation processes, and upcoming product applications. This presentation will outline and describe the events that transpired at these workshops and highlight potential changes and improvements in LANDFIRE Fire Modeling products.

Loudermilk, E. Louise

Dr. Loudermilk, Research Ecologist, USDA Forest Service, Center for Forest Disturbance Science, Athens, GA. She has developed ecosystem models to better understand processes that occur at multiple spatial and temporal scales. These models simulate plant-plant interactions, stand-level demographics, and landscape succession. Model results are used to test ecological theory and project forest response to changes in disturbance and examine ecosystem feedbacks, especially in relation to wildland fire. One notable achievement includes correlating the three-dimensional structure of fine-scale surface fuels to two-dimensional measurements of fire radiative energy (Loudermilk et al. 2012, International Journal of Wildland Fire).

Does fire behavior drive community assembly through neutral processes in frequently burned ecosystems?

Oral Presentation

Longleaf pine (Pinus palustris Mill.) ecosystems are remarkably rich in understory plant species, which is correlated with frequent (1-3 year interval) low-intensity fires. However, the mechanisms driving plant community response to fire remain unclear. We are testing whether processes predicted by Neutral Theory explain the high diversity encountered in frequent burned stands but then transition to deterministic processes as fire frequency is reduced. We are also testing whether these patterns and processes in varying fuel conditions can be predicted by overstory structure. A cellular automata (CA) model has been developed to examine the links between spatial plant demographics and fine-scale fire intensity measurements derived from infrared thermography. Using the CA model, we test for neutrality and deviations from neutrality using both empirical data and simulations of varying fire frequency and intensity. We will discuss results to date on fuel and fire mechanisms that drive patterns of plant community assembly in these systems and discuss the relevance in frequently burned systems globally.

Lutes, Duncan

Duncan Lutes is a fire ecologist at the Missoula Fire Sciences Lab, Fire Modeling Institute. In addition to his work on FFI, Duncan has been involved in the development of a number of fire applications including FIREMON, FOFEM and FuelCalc.

FFI-Ecological Monitoring Utilities

Poster Presentation

FFI (FEAT/FIREMON Integrated) and FFI-Lite were developed to assist managers with collection, storage and analysis of ecological information. FFI provides software components for: data entry, data storage, Geographic Information System (GIS), summary reports and analysis tools. FFI-Lite is designed for field data collection and smaller monitoring programs. It provides the features of FFI, with the exception of the GIS toolbar. In addition to a large set of standard FFI protocols, Protocol Manager lets users define their own sampling protocol when custom data entry forms are needed. The standard FFI protocols and Protocol Manager allow FFI to be used for monitoring in a broad range of ecosystems. FFI is designed to help managers fulfill monitoring mandates set forth in land management policy. It supports scalable (project to landscape scale) monitoring at the field and research level, and encourages cooperative, interagency data management and information sharing. Though developed for application in the U.S., FFI can potentially be used to meet monitoring needs internationally.

Lydersen, Jamie

Jamie Lydersen is a Biological Science Technician at the Pacific Southwest Research Station, USDA Forest Service, in Davis, California. Jamie received a Master of Science in Ecology from the University of California, Davis in 2012. Her thesis focused on topographic variation in forest structure in Sierra Nevada mixed-conifer forests following reintroduction of frequent, low severity fire regimes. In her current position Jamie continues to do research focused on fire and forest restoration.

Landscape interaction of previous fire and fuel treatments and Rim Fire severity

Oral Presentation

With large wildfires becoming more frequent, understanding how previous fires and fuel treatments influence subsequent fire severity and spread across a landscape is of interest to managers of fire-prone forests. The 2013 Rim Fire in the Sierra Nevada burned 104,131 ha primarily in conifer forest and through substantial acreage that had previously burned or been treated for fuels reduction, creating a rare opportunity to study fuel treatment effects across a large landscape. Using imagery-derived burn severity estimates, we assessed the effect of previous wildfire severity, thinning, surface fuel manipulation and prescribed fire on Rim Fire severity. Areas previously burned at high severity had the greatest proportion of high severity fire in the Rim Fire, followed by areas that lacked previous fires or fuel reduction. The lowest proportion of high severity occurred in areas that were previously burned in prescription fires or were classified as unchanged in previous wildfires. Forest thinning was associated with lower fire severity in plantations and when coupled with prescribed fire. Rim Fire severity also tended to increase with treatment/fire age. Our results suggest that previous fire and fuel treatments can influence wildfire severity, but their effect varies with the type and age of the treatment.

Lyon, Katie

Katie Lyon is a Ph.D. student in Human Dimensions of Natural Resources at Colorado State University. Her research focuses on how communities and individual homeowners prepare for wildfire. Katie is also a member of a multidisciplinary team of graduate students conducting research sponsored by the National Socio-Environmental Synthesis Center (SESYNC) on human-fire dynamics in San Diego's wildland-urban interface.

Fire on the fringe: empirically parameterizing defensible space behavior in an agent based model

Oral Presentation

An integrative understanding of the human dimensions of fire within the wildland-urban interface (WUI), particularly homeowner defensible space behavior, is crucial to contemporary wildfire and land management. The cumulative effect of defensible space could provide significant protection of structures by impeding fire movement through reduced fuel loads. As such, understanding the process of defensible space behavior adoption by homeowners within the WUI is imperative. Agent-based models provide a useful tool to simulate and understand individual household-level behaviors and their feedbacks on fire processes within the WUI. Based on empirical data derived from a survey administered in San Diego County's WUI (n = 724), we parameterized agents' defensible space behavior as a function of experience with fire, neighbor's behavior, and demographic characteristics. Results illustrate significant spatial heterogeneity in reported behaviors, and point to the importance of capturing this heterogeneity in models exploring the interactions between fire occurrence and adoption of defensible space behavior.

Individual- and community-level influences of wildfire preparedness

Oral Presentation

To prepare for worsening wildfire events, federal, state, and local government agencies have actively promoted actions homeowners can do to prepare for and reduce the risk of fire on their property (e.g., creating defensible space). However, research has consistently found that levels of preparedness remain low even where risk may be high. Additionally, individual level factors alone have been inadequate in explaining intentions to adopt wildfire preparedness behaviors. If the goal is to have property owners implement these practices, it is important to understand the range of factors that motivate or prevent them from taking action. For this paper we use a multi-level model approach, which is rooted in the concept that individuals are influenced by the social groups they belong to and that these groups have separable attributes to measure. For example, people are part of a community or homeowner association that has varying norms of appropriate neighbor behavior and community cohesion. Using data from a survey of Colorado homeowners, we examined individual- and community-level influences on adoption of wildfire preparedness actions. Results indicate that the addition of community-level variables to the model resulted in a significant improvement in explaining intentions to adopt preparedness behaviors.

MacKnight, Kathryn

Kathryn K. MacKnight is a Research Assistant for the Colorado Forest Restoration Institute at Colorado State University assessing variability in Gambel oak woodlands in the Southern Front Range of Colorado. She holds a

B.S. in Rangeland/Restoration Ecology from Colorado State University. She has contributed to the Rocky Mountain Cheatgrass Management Project, a collaboration between the University of Wyoming and Colorado State University in addition to numerous projects within the Restoration Ecology Laboratory directed by Dr. Mark Paschke at Colorado State University

Classifying Gambel oak fuels complexes in the front range of Colorado

Student Poster Presentation

Expansion of the wildland urban interface has resulted in increased concern regarding the nature of fuels and fire hazard within Gambel oak dominated communities and the potential for adverse consequences of wildland fires. A central step in quantifying fire hazard and designing treatments that reduce this hazard is a comprehensive, accurate and detailed description of wildland fuels and the response of vegetation to manipulation. The goals of this project are to assess the variability in Gambel oak woodlands and to develop a landscape scale fuels classification system for Gambel oak woodlands along the front range of Colorado. To meet these objectives we collected fuel loading and species composition, soil properties and topographic variables on a network of randomly distributed plots across the oak dominated woodlands along the front range of Colorado. Our preliminary data shows considerable variability in total above ground biomass (9 to 40 tons per acre) across oak woodlands. Future analysis will begin to explore the topographic and climatic controls of this variability. Ultimately the development of such a system will foster communication between managers, scientists and other professionals and provided a basis for future research investigating the potential fire hazard and ecological consequence of fuels management in oak dominated communities.

Magalhaes, Rita Margarida

Rita Margarida Magalhaes PhD Candidate, Department of Biological Sciences, Texas Tech University Rita graduated with a bachelors in Forest Engineering from her native Lisbon, Portugal and her interested in Fire Ecology has led her to work in projects involving the Portuguese government, the European Space Agency, and to her graduate studies in the U.S.. In 2009 she joined the Schwilk Lab, in 2011 she got her Master's, and the following year published her paper "Leaf traits and litter flammability: evidence for non-additive mixture effects in a temperate forest" and started the PhD program she is expecting to finish in the next year.

Moisture content overwhelms the effect of volatile content in litter flammability of a mixed-conifer forest

Oral Presentation

In mixed-conifer forest, where surface fires burn leaf and twig litter, fire behavior is influenced by leaf traits and therefore by community composition. Past work has shown that flammability of dry fuels is driven by leaf size and litter packing. Fuel moisture, however, strongly influences flammability, and, for this study, we aimed to disentangle moisture, packing and volatile effects on litter flammability. Leaf litter was collected from 8 tree species in Sequoia and Kings Canyon National Parks, California, USA. Laboratory experiments determined the dessication index of each species. Samples were burned on a wide range of moisture contents and their flammability assessed. Species with lower bulk density, such as oak and pines, have higher dessication rates than firs, sequoia and incense cedar. Moisture content altered the relative flammability of the 8 species in this study and this overwhelms the effect of volatile content. Oak and the pines remain flammable at higher moisture contents when compared to volatile-rich species such as incense cedar, fir or sequoia. This effect is likely to persist in fuel mixtures where the constituent species have different dessication indices and therefore will have different moisture contents.

Maginel, Calvin

Calvin Maginel received his MS from the University of Missouri--Columbia in summer of 2015. He is a fire practitioner during the dormant season and a botanist during the growing season.

Landscape-scale prescribed fire effects on Ozark ground flora communities

Oral Presentation

As managers increase the use of prescribed fire as a restoration tool in the Missouri Ozarks, monitoring of vegetative response to treatment is critical. A landscape-scale study at Chilton Creek Management Area (CCMA) using prescribed fire to restore vegetative communities was initiated in 1997, with the nearby Missouri Ozark Forest Ecosystem Project (MOFEP) used as an unburned control for treatment comparison. This study provides a unique opportunity to study the effects of repeated controlled burning on vegetative communities both at the landscape scale and within individual site types. Effects of varied prescribed fire frequency on plant community response were determined. Results from this analysis may support the concept of species replacement, with fire-sensitive species decreasing in frequency while being replaced by fire tolerant species, leading to little overall increase in species richness. We found positive plant community response on exposed aspects and no negative effects on other site types studied. In addition, increasing values of the Wetness Index on burned sites may support the hypothesis of xerification of post-fire landscapes. This study supports continued use of prescribed fire in the Missouri Ozarks for restoration projects at the landscape scale, and includes a novel use of the Wetness Index.

Mahalingam, Shankar

Dr. Shankar Mahalingam is Dean of the College of Engineering and Professor in the Department of Mechanical and Aerospace Engineering at The University of Alabama in Huntsville (UAH). He received his B.Tech. from the Indian Institute of Technology, Madras, M.S. from the State University of New York at Stony Brook, and Ph.D. from Stanford University, all in Mechanical Engineering. From 1989 to 2000, Dr. Mahalingam was on the faculty in the Department of Mechanical Engineering at the University of Colorado, Boulder. From 2000 to 2010, he was Professor in the Department of Mechanical Engineering at the University of California, Riverside, and served as Department Chair during six of these ten years. Professor Mahalingam's research interests include direct and large eddy simulations of turbulent combustion, forest fire modeling, flame spread experiments, acoustic-flow interactions pertinent to solid rocket motors, and cardiovascular fluid dynamics. Dr. Mahalingam served as Associate Editor of the AIAA Journal and as a Member-at-Large of the Board of the Western States Section of The Combustion Institute. Dr. Mahalingam is an Associate Fellow of AIAA, and Fellow of ASME.

A Full-physics Computational Study of Pyrolysis and Ignition of a Leaf-like Fuel Element Exposed to Convective Heating

Oral Presentation

A horizontally oriented fuel element, akin to a live leaf containing moisture, was exposed to hot air flowing vertically in a computational configuration resembling a recent experimental study reported in the literature. The pyrolysis model included thermal degradation of hemicellulose, lignin, cellulose, and moisture in the form of bound and free water. An improved version of the coupled Gpyro3D/FDS model was used for full-physics computations. Moisture evaporation and temperature rise began at the periphery of the element. Soon thereafter, free water evaporated and this process determined the temperature response of the solid fuel. Then ignition occurred while a significant amount of moisture remained at the midsection of the element. Evaporation of bound water was initiated at about the time of ignition and this continued until most of the fuel was burnt out. Evaporated water vapor in the gas phase reduced the oxygen concentration around the solid fuel thereby affecting the gas phase combustion process. The computational results were found consistent with published experimental results in terms of ignition time, burnout time, evolution of fuel mass, and overall flame spread pattern.

Maier, Craig

Craig Maier, Coordinator, Tallgrass Prairie and Oak Savanna Fire Science Consortium Craig Maier serves as the coordinator of the Tallgrass Prairie and Oak Savanna Fire Science Consortium, where he led the planning of the 2015 Midwest Fire Conference. Jack McGowan-Stinski, Progam Manager, Lake States Fire Science Consortium Jack McGowan-Stinski has over 20 years of experience working with fire management for The Nature Conservancy and Cardo JFNew. During his career, Jack has led over 325 prescribed burns and has participated as crew or cadre on an additional 150 plus burns.

The Burning Issues Paradox - How a Narrow Focus Led to "New Ways of Thinking & Awareness"

Oral Presentation

We developed the Burning Issues Symposium to address contentious questions in southwest Michigan. We expect the core question will be familiar to fire ecologists and land managers across the planet: "How do we use prescribed fires to sustain fire-dependent vegetation without harming rare wildlife species harbored on small habitat fragments?" A discussion that began between two JFSP knowledge exchange coordinators and one land manager grew into an event that included 95 participants representing 19 organizations and four states. Land managers, biologists, researchers, and fire managers gathered for a day and a half to hear expert presentations, pose questions for panel discussions, and bring forward their challenges and ideas during breakout sessions. We present this event as a case study illustrating three principles that others may be able to apply to their burning issues: knowledge-sharing events organized around specific questions; encouraging resource managers to participate as both producers and consumers of knowledge at science-based meetings; and leveraging the neutral stance and regional scope of the consortia to gather a diverse audience. We invite stakeholders to think of the JFSP networks as your network. One individual can be the catalyst for engaging, productive knowledge exchanges with regional impact.

Marks, Christopher

Chris Marks is the Deputy Fire Mangement Officer at Grand Canyon National Park. He has been involved with wildland fire for 23 years, working on engines, hotshot crews, in fuels, and in fire management. He has been at Grand Canyon for the past 12 years.

Burning Southerly Aspects to Reduce Fire Severity in Dry Mixed Conifer Forest at Grand Canyon NP

Oral Presentation

The North Rim of Grand Canyon National Park contains a large area of homogenous dry mixed conifer forest that has not experienced fire since the late 1800s. Recent lightning-ignited fires have been suppressed in this area due to data suggesting the potential for undesirably large areas of high severity fire. During the fall of 2014, fire management implemented a prescribed fire focused on southerly aspects and designed to create more heterogeneity in this landscape. The prescribed fire cost $7.70 per acre and used strategic aerial ignition and prescription parameters to eliminate the need for potentially unsafe and costly holding lines in the proposed wilderness. Pre- and post- treatment analyses were conducted using FlamMap in order to ascertain how changes in fuel loading and continuity from this project affected potential fire behavior. We quantified potential fire behavior under conditions similar to those typical of fire season with the intent of determining the conditions in which resource objectives can be met in the area using natural ignitions.

Marschall, Joseph

Joseph Marschall, Senior Research Specialist, Missouri Tree-Ring Laboratory at the University of Missouri also serves at the coordinator for the Oak Woodlands & Forests Fire Consortium.

Documenting Frequent Fire Regimes in Mixed Pine-Oak Forests of Pennsylvania

Oral Presentation

Current understanding recognizes that recurring fires were historically important for maintaining fire-associated communities in the central Appalachian mountains of Pennsylvania, including those partially composed of pitch, Table Mountain, and/or red pine (Pinus rigida, P. pungens, and P. resinosa), as well as oak (Quercus) forests, woodlands, and barrens. The successful application of prescribed fire to restore and maintain these fire-associated ecosystems is enhanced by knowledge of the fire regime conditions from which they were adapted. However, there is little quantitative data describing regional fire regime attributes such as frequency, severity, and seasonality, or how these varied through time and across regions and habitats. Dendrochronology studies using fire-scarred remnant tree material (stumps, snags, and living trees) offer site specific information regarding historical fire regimes attributes, from which modern management can be informed. Here, we report results from four study sites spanning four centuries (~1600 CE to present) in the Ridge and Valley region of Pennsylvania and discuss management implications.

Martell, David

David Martell is a Professor (forest fire management systems) in the Faculty of Forestry at the University of Toronto. He completed his B.A.Sc., M.A.Sc., and Ph.D. in the Department of Industrial Engineering at the University of Toronto where he studied Management Science and Operational Research and their application to forest fire management. His current research interests include the application of operational research and information technology to fire and forest management and the development of decision support systems for fire and forest managers. The Canadian Operational Research Society awarded him its 2009 Award of Merit.

Using discrete stochastic fire scar scenarios to evaluate landscape management strategies

Oral Presentation

Managers of many flammable forest landscapes are increasingly expected to incorporate the potential impact of fire and other uncertain disturbance processes in their strategic planning processes. This poses significant challenges because in order to do so they must 1) model the complex stochastic fire ignition and spread processes that generate fire scars, 2) incorporate those stochastic fire scar models in their strategic planning models and 3) solve the planning models to generate good feasible solutions. We describe a methodology for generating discrete stochastic fire scenarios, apply our methodology to a strategic stochastic timber harvest planning problem and compare our results with those produced when traditional burn probability models are applied to such problems.

Martin, Charley

Charley has been a member of the LANDFIRE Fuels Production Team for the past six years. This production primarily includes, coordinating with other internal production teams to insure logic and spatial accuracy, external partners for input and product accuracy, and quality control of the final fuel products. He holds degrees in Geography and History from Southern Illinois University and began his fire career on the Willamette National Forest in 1981. Some of his work experience includes Crew Foreman, Burn Boss, Fuel Specialist, Hotshot Superintendent, Type 3 Incident Commander, Fire Behavior Analyst, Long Term Analyst, and Fire Ecologist.

Seasonally dynamic surface fuel model data from the LANDFIRE Program

Oral Presentation

LANDFIRE has developed methods for mapping seasonally dynamic surface fuel models for two pilot areas of the US. These processes differ based on the locally determined drivers of seasonal fuel changes. In the southeastern US, the Keetch-Byram Drought Index (KBDI) is used as an indicator of moisture availability which, in turn, is related to the amount of surface fuel available for burning. In the southwestern US and Great Basin region, Landsat-derived Normalized Differenced Vegetation Index (NDVI) for the current year is compared to historical NDVI ranges which, in turn, is related to the amount of herbaceous cover on the landscape. In both areas, the surface fuel model assignments are adjusted based on the relative fuel loads derived from these methods. The southeastern data is available through the Wildland Fire Decision Support System and is updated regularly using KBDI grids computed from the Wildland Fire Assessment System. The southwestern data is updated annually in the spring based on each year's NDVI data. In the southern-most portion of this region, a fall dataset is also generated to capture vegetation growth from monsoonal moisture. These data are available through the LANDFIRE data distribution website. Additional regions are being considered for future development.

Martin, R

R. Adam Martin works as a Prairie Restoration Specialist at the Center for Natural Lands Management. His work focuses on the collaborative restoration of glacial outwash prairies in the Puget Sound region of Washington state. His biggest achievements include contributing in documenting and bringing to light the drastic decline and disappearance of annual plants in these prairies, and contributing to the successful recovery trajectory of the federally threatened plant Golden paintbrush.

Burning for biodiversity: lessons from the South Sound

Oral Presentation

Prescribed fire is a keystone tool in integrated prairie management. Controlling invasive species and promoting native biodiversity are often two primary objectives. Understanding how fire severity impacts these objectives is imperative, because fire severity can be manipulated by changing fire prescriptions and fire ignition patterns. We use classic indicator species analysis and taxa indicator threshold analysis (TiTAN) to assess how native and exotic plant taxa and plant communities respond to prescribed burning and fire severity across multiple sites in the South Puget Sound region of Washington State. At the broadest level, burning increased both native and exotic richness, though individual native and exotic taxa responded variably. Burning successfully decreased the presence of exotic grasses and shrubs, but this was followed by an increase in exotic forbs. Native forbs increased more than native grasses post fire. Increasing fire severity shifted native and exotic plant communities towards annuals. However, these higher severity burns were dominated by exotic species, since few native annuals remain in this region. We suggest fire managers should strive for intermediate fire severity to balance promoting native biodiversity and controlling target exotic species.

Martínez-Torres, Héctor

Héctor L. Martínez-Torres is a Ph. D. candidate at the Ecosystem and Sustainability Research Institute of the National Autonomous University of Mexico. . He has worked in the field of the ethnobiology and is currently developing his dissertation research in traditional use of fire with rural communities in the Monarch Butterfly Biosphere Reserve . In 2013 he obtained a PhD scholarship from the International Association of Wildland Fire to develop part of his research.

Traditional Fire Knowledge Systems in a temperate forest ecosystem

Oral Presentation

The importance of incorporating the traditional knowledge in the planning and management of fire has been discussed recently. This is of special importance in Natural Protected Areas inhabited by rural indigenous communities that use fire in different activities. However, in cases like the Monarch Butterfly Biosphere Reserve (MBBR) in Mexico, we have very little information about who, how and why fire is used. Our objectives were to describe the profile of users of fire, document the traditional uses of fire, and recognize the ecological and social elements considered in the use of fire. We found that most users of fire are small farmers that learned about how fire is used from their parents. The most common use of fire is the method of "burn in mounds" that consists in the extraction, gathering, drying & burning of the weeds that grow up in their agricultural plots. The interviewed mentioned nine ecological elements, related with topography, weather and fuels, and mentioned fourteen aspects related with the economic decisions, the risks, and local rules by the of use of fire. With these elements, we can suggest the existence of a Traditional Fire Knowledge System in the MBBR.

Towards integrated fire management in a Natural Protected Area: What do local key actors say?

Poster Presentation

Integrated Fire Management (IFM) proposes to consider the ecological, social and economic aspects of fire in the ecosystem, and has emerged as a new paradigm for fire management planning. One major challenge to achieve an IFM is to move away from practices associated with the fire suppression policy that prevailed during much of the past century. In the Monarch Butterfly Biosphere Reserve in Mexico, most fire management activities are still oriented towards fire suppression. The objectives of this work were to identify the key actors involved with fire management in this Reserve and investigate their perceptions about fire management, and to recognize and discuss which are their skills, values and attitudes that can contribute or are opposed to an IFM. We found that fire is perceived as undesirable, destructive and something to be avoided. Only few actors know the concept of IFM, and actions such as prescribed burning and fuel management are quite unknown. It is necessary to promote the IMF concept, generate local knowledge about fire ecology, and integrate cultural and economic values associated with fire. Additionally, it is essential to recognize and involve all stakeholders in decision-making to achieve an IFM in this Biosphere Reserve.

Masarie, Alex

Mr. Alex Masarie is a second-year PhD student at Colorado State University in Fort Collins, Colorado. As a Graduate Research Assistant his mathematically creative approach to fire management problems has contributed to development of multi-stage stochastic programming techniques and more recently partial differential equation models. Alex is a returned Peace Corps volunteer having served in rural Panama from 2012 to 2014 working with community counterparts on potable water systems and agricultural projects.

A continuous space-time domain model for fire resource movement

Oral Presentation

As many fire management application problems are inherently discrete, modelers often apply discrete time and space solution techniques. Discrete models formulated as mathematical programs, stochastic processes, and cellular automata, among many others, have greatly increased the community's understanding and answered the call for actionable fire science. However as research often does, these efforts have unearthed a plethora of further questions, many of which are now being studied on continuous temporal and spatial domains. With such an active and international effort, solving problems in fire management with ordinary or partial differential equation (ODE and PDE, respectively) models—such as pseudo-spatial predator-prey ODE systems or field theories of heat conduction on temporally/spatially continuous domains—is no longer as lofty a goal as it once was. We study a parabolic, self-adjoint PDE model for the Geographic Area Coordination Center (GACC)-level resource movement problem and propose a solution using a finite element method. We explore optimization methods based on control theory, the energy norm, and minimal surface theory of differential geometry. While it remains an open challenge to reconcile mathematical complexity with actionable science, fire presents a real opportunity to create user interfaces with the flexibility and speed managers need on the ground.

Massman, William

William J. Massman, Meteorologist, USDA Forest Service For the past 29 years the scientist has been a research meteorologist at the Rocky Mountain Research Station (Fort Collins, CO). Prior to that he worked at NASA/Goddard Space Flight Center in Greenbelt, MD as a National Research Council Senior Postdoctoral Fellow. In 2010 he served as a Distinguished Visiting Scientist at the Commonwealth Scientific and Industrial Research Organization, Canberra, Australia. He has also worked at the National Center for Atmospheric Research and served as an Associate Technical Principal Investigator for the San Joaquin Valley Air Quality Study and The California Ozone Deposition Experiment.

A non-equilibrium model for soil heating and moisture transport during extreme surface heating

Oral Presentation

The increasing use of prescribed fire by land managers and increasing likelihood of wildfires due to climate change requires an improved modeling capability of extreme heating of soils during fires. This study describes a new model of soil evaporation and transport of heat, soil moisture, and water vapor, for use during fires. The model is based on conservation equations of energy and mass and its performance is evaluated against dynamic soil temperature and moisture observations obtained during laboratory experiments on soil samples exposed to surface heat fluxes ranging between 10,000 and 50,000 Wm2. In general, the model simulates the observed temperature dynamics quite well, but is less precise (but still good) at capturing the moisture dynamics. The model emulates the observed increase in soil moisture ahead of the drying front and the hiatus in the soil temperature rise during the strongly evaporative stage of drying. It also captures the observed rapid evaporation of soil moisture that occurs at relatively low temperatures (50-90 C), and can provide quite accurate predictions of the total amount of soil moisture evaporated during the laboratory experiments. Overall, this new model provides a much more physically realistic simulation over all previous models developed for the same purpose.

Masters, Ronald

Dr. Ronald E. Masters is Associate Professor of Wildland Fire at the University of Wisconsin-Stevens Point. He was Director of Research with Tall Timbers Research Station for 10 years. He was Associate Professor of Forestry and Wildlife Specialist with Oklahoma State University for 11 years. He has conducted research in the Quachita Highlands of Oklahoma and Arkansas for over 30 years. His research interests include fire ecology, ecosystem restoration, and wildlife and plant community ecology. He received his Ph.D. in Wildlife and Fisheries Ecology from Oklahoma State University.

Fire Frequency as a Determinant of Succession Pathway on Xeric Oak-Pine Sites

Oral Presentation

We examined woody plant succession pathways in response to stand restructuring and fire frequency over 30 years on Pushmataha Wildlife Management Area in southeast Oklahoma, USA. Our purpose was to determine the efficacy of fire frequency and thinning as management tools for restoration of oak savanna, oak woodlands, pine-bluestem woodlands, and pine savanna. On selected experimental units we reduced stand density in 1984 to near pre-settlement conditions. Thinned stands were subjected to 0-, 4-, 3-, 2-, and 1-year late dormant season (late Feb- early April) fire frequency regimes for 30+ years. For comparison we withheld control units from treatment and also included unthinned but with 4-year burn regime treatment units. We included two additional thinning treatments, oak-savanna and pine-bluestem, both with annual burn regimes. The oak-savanna had all pine removed (approximately 50 percent of basal area) and the pine-bluestem had half of the hardwood thinned (approximately 25 percent of basal area). We found that woody plant succession followed a combination of relay floristics and initial floristics succession models with specific pathways determined by fire frequency. The 3-year fire frequency interval appears to be an ecological threshold with more frequent fire shifting the plant community from woody to herbaceous dominance.

McAllister, Sara

Sara McAllister is a research mechanical engineer with the USDA Forest Service at the Missoula Fire Sciences Laboratory. She completed her PhD at the University of California, Berkeley and has been with the Forest Service since 2009. She has authored over 40 conference and journal papers, as well as a textbook on combustion fundamentals that is used around the world and has been translated into four languages.

Shape effects on the convective ignition of wood

Oral Presentation

In order to develop more accurate models of wildland fire that address the weaknesses of the current models, a better understanding of the physical mechanisms of wildland fire spread is needed. In particular, viewing fire spread as a series of ignitions will help address many of the poorly predicted aspects of wildland fire such as unsteady spread, crown fire initiation, and spread thresholds. Radiation has long been assumed to be the primary heat transfer mechanism; however, recent evidence indicates that it is, in fact, convection that ignites the fine fuels responsible for wildland fire spread. Unfortunately, ignition by convection is not a well understood process. In order to gain some insight into the problem, an apparatus was built to heat air over a range of temperatures from ambient to 700°C. As wildland fuels come in a variety of shapes and sizes which will affect the convective heat transfer, this presentation will discuss the results of experiments designed to explore shape effects on convective ignition. Specifically, cylinders and disks of red oak with a range of diameters and thicknesses were tested.

McCarley, Ryan

Ryan McCarley is a graduate student in the Geography Department at the University of Idaho with a strong background in GIS and remote sensing. His primary interest in fire ecology is the improvement of burn severity mapping especially through the integration of Landsat and LiDAR data.

Linking LiDAR-measured fire effects with traditional reflectance-based burn mapping

Oral Presentation

Measuring post-fire effects using remote sensing is critical to an ecological understanding of wildfire at the landscape scale. While this is predominantly accomplished with multi-spectral imagery, questions remain regarding how spectral changes caused by fire and quantitative forest variables are related. This project aims to fill this knowledge gap and advance methods in mapping burn severity by comparing forest changes in biomass and canopy cover derived from Light Detection and Ranging (LiDAR) with spectral changes captured by Landsat Thematic Mapper (TM) and Operational Land Imager (OLI). Both LiDAR and Landsat data were acquired opportunistically before and after the 2012 Pole Creek Fire in central Oregon along the eastern Cascade Mountains, allowing for the unique possibility of this analysis. Project objectives are to (1) develop spatial regression models for predicting biomass and canopy cover using spectral indices commonly used in burn severity mapping and (2) identify the best models and test them on random subsets of data. Given increasing utilization of landscape scale fire-effect maps derived from passive remote sensing, the outcomes of this study will help support land managers and scientists by providing a link from spectral response to changes in biomass and canopy cover.

McHugh, Charles

Charles W. McHugh is a forester with the Rocky Mountain Research Station, Fire, Fuel, and Smoke Science program at the Missoula Fire Sciences Laboratory.

Comparison of temperature and relative humidity values from Sling Psychrometers and Electronic Weather Meters in an Controlled Environment

Oral Presentation

Belt weather kits for obtaining weather information on prescribed fire and wildfires have been in use since the 1960's. The use of a sling psychrometer from these kits is standard practice for the determination of dry and wet bulb temperatures to calculate relative humidity from a corresponding set of tables. Electronic based meters for obtaining weather information could replace belt weather kits, streamline the process, and eliminate many of the errors often associated with the use of the sling psychrometer. However, anecdotal evidence from fire managers suggest relative humidity values of 5-20% lower from electronic meters compared to a sling psychrometer. Thus contributing to a disbelief and lack of confidence in the data electronic meters could provide field personnel. We will present results of a study comparing measured temperature and relative humidity values from electronic meters -such as the Kestral®- to temperature and calculated relative humidity using a sling psychrometer. All measurements were taken in an environmental chamber allowing us to set the values across a known range of temperature and relative humidity. This study comparing values from these two types of measuring devices in a controlled environment is the first we are aware of.

McKerrow, Alexa

Alexa McKerrow is ecologist and remote sensing analyst with the U.S. Geological Survey. For 20+ years Dr. McKerrow has been involved with the National Gap Analysis Program with a focus on vegetation mapping. Currently her work centers on GAP's active collaboration with the LANDFIRE Program and a wide variety of national projects including the Aquatic GAP, National Fish Habitat Assessment Program, and the Federal Geographic Data Committee's National Vegetation Classification Standard. Throughout the development of the National Cohesive Wildlife Fire Strategy Alexa served as a member of the Southeast Regional Wildland Fire Cohesive Strategy Committee.

Sources of uncertainty in projecting extreme fires in the Southeastern Coastal Plain

Oral Presentation

Human-caused climate change is predicted to affect the frequency of hazard-linked extremes. Unusually large wildfires are a type of extreme event that is constrained by climate and can be a hazard to society but is also an important ecological disturbance. In this study we projected changes in the frequency of extreme monthly area burned by wildfires for the end of the 21st century in a wildfire-prone region of the Southeast U.S. Predicting changes in area burned is complicated by the large and varied uncertainties in how the climate will change and in the models used to predict those changes. We characterized and quantified multiple sources of uncertainty to explore the implications on the projections of future area burned. We found non-trivial probabilities for an increasing number of extreme wildfire months for the period 2070-2099 (95% projection interval of 5 fewer to 28 more extreme fire months for a high fossil fuel emissions scenario). Our approach illustrates that while accounting for multiple sources of uncertainty in global change science problems is a difficult task, it is worthwhile and necessary to properly assess risks and help pave the way to better understand and adapt to these society-relevant events.

McMillin, Joel

Dr. Joel D. McMillin serves as Entomologist and Group Leader of the Forest Health Protection unit in Boise, Idaho. His expertise focuses on forest health and disturbance ecology, with an emphasis on bark beetles. Aside from his technical and administrative responsibilities, Dr. McMillin regularly participates in forest research working closely with Forest Service R&D and University partners throughout western North America.

Bark Beetle Responses to Fuel Management Treatments Involving Chipping and Mastication

Oral Presentation

For millennia, frequent, low-moderate intensity wildfires have sculpted seasonally-dry forests in the western U.S. reducing the quantity and continuity of fuels and discouraging establishment of fire-intolerant species. However, fire suppression, preferential harvest of large-diameter trees, and land conversions, among other factors, have altered fuel conditions over millions of hectares of forests such that todays wildfires tend to be larger and more severe. This emphasizes the need for well-designed fuel management treatments to reduce the extent and severity of wildfires, particularly in the wildland urban interface where mechanical treatments are frequently used due to concerns regarding air quality and structural protection associated with the use of prescribed fire. Since sufficient markets have yet to be developed for small dimensional material much of the tree biomass resulting from these treatments is chipped and/or masticated and redistributed on site. However, these actions result in increased amounts of host volatiles released into the active airspace of forests, which may attract certain bark beetle species. We review related research concerning bark beetle responses to fuels management treatments involving chipping and mastication, and provide guidelines for minimizing tree losses due to bark beetles following such treatments.

McWhorter, Ira

Ira McWhorter is an Ecologist with the National Forests and Grasslands in Texas and has worked in longleaf pine ecosystem restoration and management for over 37 years in both the public and private sector. He received a Master of Science degree at Stephen F. Austin University in 2005 and has been employed by the US Forest Service since that time. His work with the USFS has focused on ecological restoration, wilderness fire management and fire effects monitoring. .

Prescribed Fire in Upland Island Wilderness

Oral Presentation

Abstract: In 2010, the US Forest Service, Southern Region approved the use of prescribed fire in the 13,250-acre Upland Island Wilderness (UIW) on the Angelina National Forest in Texas. The primary purpose of this effort was to reduce hazardous fuels and restore the ecological role of fire. Historically, Upland Island Wilderness consisted of open and diverse longleaf pine (Pinus palustris) ecosystems which depended on frequent, low-intensity surface fires. As in many other relatively small wilderness areas, the vegetation and fuel conditions in the UIW underwent extensive changes after wilderness designation in 1984. Prescribed burns were no longer allowed resulting in an increase of shade-tolerant trees and shrubs, heavy accumulations of duff and pine litter, and loss of suitable habitat for several rare species, including the red-cockaded woodpecker (Picoides borealis). In addition, the unnatural fuel accumulations created a serious fire hazard that threatened the safety of firefighters, private citizens, adjacent properties, and the wilderness resource itself. Two prescribed burns totaling over 12,000 acres have been conducted thus far with varying results. A fire effects and wilderness character monitoring program was developed to document the results of prescribed burning and to guide future management.

Medler, Michael

Dr. Michael Medler is a past president of the Association for Fire Ecology and also the founding editor of the journal Fire Ecology. His research and teaching interests center on pyrogeography and using spatial technologies to inform both wildland fire science and the policy arena. He currently teaches at Western Washington University's Huxley College of the Environment and received a Ph.D. in Geography from the University of Arizona. Earlier in his career he worked on wildland fire crews.

The Wildland Fire Deficit in the United States

Oral Presentation

Prior to effective fire suppression, most U.S. ecosystems coevolved with fire regimes requiring specific ranges of spatial and temporal extents of fire to prevent ecological changes. Therefore, along with other dynamic changes,

fire suppression may be causing fire deficits and unintended ecological consequences. This research quantified the fire deficit for each U.S. state from 1992 to 2012. We derived the annual spatial extent burned for each state from the U.S.D.A. National Fire Occurrence Database. The historically expected annual fire extent was derived by dividing total area by expected fire return intervals for each undeveloped land class in the LANDFIRE Mean Fire Return Interval data, which is imperfect, but does provide a national level tool. Over this time period, for every state except Alaska, the historically expected annual fire extent was much larger than the fire extents experienced. For the U.S. as a whole the results indicate an annual wildland fire deficit ranging from 26.6 million hectares to over 87.2 million hectares, though much of this can be attributed to grasslands with short fire return intervals. For the 11 conterminous western states and Alaska, the data indicates an annual mean fire deficit of between 5.3 and 8.0 million hectares each year.

Meigs, Garrett

Garrett Meigs is currently a postdoctoral researcher at the University of Vermont, evaluating the feedbacks among natural disturbances, forest policies, and ecosystem services. His Ph.D. at Oregon State University focused on the interactions between insect outbreaks and wildfires, which led him to numerous fascinating and dynamic landscapes across the Pacific Northwest and resulted in a recent publication in the journal Ecosphere entitled, "Does wildfire likelihood increase following insect outbreaks in conifer forests?"

Can insect outbreaks reduce the severity of subsequent forest fires?

Oral Presentation

In western North America, native insect outbreaks and wildfires have both increased in recent decades in association with climate change and land use, sparking acute concerns that insect-caused tree mortality increases dead fuels and associated wildfire impacts. Key uncertainties remain, however, regarding the influence of insects on subsequent wildfire severity (i.e., ecological impact). Here, we present a regional census of large wildfire severity following outbreaks of two prevalent bark beetle and defoliator pests, mountain pine beetle (Dendroctonus ponderosae) and western spruce budworm (Choristoneura freemani), across the US Pacific Northwest. We integrate seamless, Landsat-based maps of insect damage and burn severity with sequential autoregression modeling at the fire event scale (n = 81), evaluating insect predictors across all fires in a regional meta-analysis framework. We show that, contrary to common assumptions of compounding effects, insects actually reduce the severity of subsequent wildfires, with specific effects dependent upon insect type and timing. We suggest that insect outbreaks effectively thin forests, reducing the density of residual trees susceptible to wildfire. Because native insect outbreaks do not necessarily increase the ecological impacts of subsequent wildfires, we recommend a precautionary approach when designing and implementing forest management policies aimed at reducing wildfire hazard.

Menakis, Jim

Jim Menakis has been the National Fire Ecologist for Forest Service Washington Office Fire and Aviation Management since 2010. Prior to 2010, Jim worked at RMRS Missoula Fire Science Laboratory for 20 years on various: research projects relating to fuels and fire ecology, national mapping projects, and applying the best available science to support management needs. Today Jim is working on evaluating the effectiveness of fuel treatment when tested by wildfire, supporting multi-scale wildfire risk assessments, and supporting the FS fire ecology program. Jim Menakis received his B.S. in Forestry and M.S. in Environmental Studies from the University of Montana, Missoula.

Comparison of several wildfire risk assessments studies completed over the last couples years for National Forest Lands in the western and conterminous United States

Oral Presentation

Wildfires can result in significant loss to ecological systems, communities, infrastructure, water quality, and other highly valued resources and assets; while threatening the life of fire fighters, emergency responders, and the general public. Escalating wildfire suppression costs and long lasting ecological and social impacts continue to threaten the financial health of federal and state land management agencies. To help address these negative effects several risk based analysis approaches have been developed to identify communities at risk from wildfires, prioritize areas for hazardous fuel treatments, inform the budget allocation process, while maintaining fire adapted ecosystems. In addition a National Cohesive Wildland Fire Management Strategy (CS) was developed to work collaboratively among all stakeholders and across all landscapes, using the best available science, to support these goals: 1) resilient landscapes, 2) fire adapted communities, and 3) safe and effective wildfire response. In this presentation we will compare the results of several risk based studies and the CS in identifying the highest priority national forests at risk to wildfires. We will review the different objectives and processes used, compare their results, and identify the top forests at risk from wildfire both nationally and by Forest Service Region based on these risk assessments.

Merschel, Andrew

Andrew Merschel, Forest Ecologist Oregon State University Andrew Merschel is a Faculty Research Assistant at Oregon State's University's College of Forestry. Andrew is currently researching historical fires regimes and their influence on forest dynamics in mixed-conifer forests in central Oregon. Andrew works closely with the DCFP, the Nature Conservancy, and the USFS PNW research station to develop local science that can help expand zones of agreement on collaborative restoration projects. Andrew lives in Corvallis and enjoys running, fishing, sanding, and hunting for old trees and fire scars.

Partnering Fire History and Forest Development Research with Collaborative Restoration in Central Oregon

Oral Presentation

The Deschutes Collaborative Forest Project (DCFP) allows stakeholders and partners to build a shared vision for landscape-scale forest restoration. Developing recommendations in mixed-conifer forests is complicated by limited data on the historical fire regime, forest structure and composition, and their variation with topography and productivity. Additionally, recent debate among fire ecologists about the historical role of fire has increased uncertainty within collaborative groups. To develop local science that characterizes the unique fire and stand dynamics of mixed-conifer forests near Bend, Oregon, we formed a research partnership between the DCFP, US Forest Service, and Oregon State University. We collected tree cores, fire scars and plot data on a systematic grid across a 26,000-acre study area characterizing historical and current forest structure and composition, and the occurrence and spatial distribution of fire. Preliminary results demonstrate large spreading fires were frequent (CFI25=16, NFR=23). Long lived trees (>450 years) were common across the study area, suggesting predominantly low-severity fire effects. However, several even-aged cohorts that were asynchronous in initiation suggest patches of high-severity fire <500 acres occurred within large fires. Historical species composition was most strongly related to productivity rather than fire history. Results are being used by the DCFP to guide restoration recommendations.

Metlen, Kerry

Kerry is the technical lead for the team developing the Rogue Basin Cohesive Forest Restoration Strategy, an all-lands decision support framework for conservation planning that integrates wildfire threat to communities, promoting and protecting enduring habitats, restoring landscape resilience, and promoting the capacity of natural communities to adapt to climate change. As a Forest Ecologist for The Nature Conservancy since 2010, he is a core member of several collaborative technical working groups, coordinates multiparty monitoring for the Ashland Forest Resiliency Project, and conducts research on reference forest conditions in mixed conifer/hardwood forests.

Collaborative landscape planning to promote resilient landscapes and fire adapted communities in an increasingly fire-prone climate: The Rogue Basin Cohesive Forest Restoration Strategy

Oral Presentation

Increasingly, forest management is guided by ecological restoration and wildfire risk mitigation. The Southern Oregon Forest Restoration Collaborative (SOFRC) has developed an all lands Cohesive Forest Restoration Strategy for a 1.9 million ha planning area. The Strategy integrates a quantitative wildfire risk assessment, protection and promotion of critical Northern Spotted Owl habitat, landscape resilience informed by the natural range of variability, and expected changes in climate. Collaboratively developed restoration principles guide prescriptive actions along management themes to strategically reduce fuels, protect and promote complex habitats, and reduce forest densities to those historically resilient to fire. Restoration management was spatially optimized with a new planning tool (Landscape Treatment Designer) to prioritize planning areas (<21,000 ha) such that landscape objectives were maximized subject to constraints including accessibility, complex habitats protection, and ensuring a predictable flow of economically viable timber as a restoration byproduct. Our work provides a case study for implementation the National Cohesive Wildland Fire Management Strategy on a large fire prone landscape, and uses advanced landscape science to prioritize management activities to achieve fire adapted communities, diverse habitats, and landscapes resilient to fire and climate change while improving suppression effectiveness and increasing the potential for beneficial fire outcomes.

Michaletz, Sean

Dr. Sean Michaletz is a Director's Postdoctoral Fellow at Los Alamos National Laboratory. He is interested in how physical processes link the environment to physiology, and how this "scales up" from cells to ecosystems. His research was recently featured in the journal Nature (10.1038/nature13470).

Sapwood dysfunction kills trees faster than girdling: A test of post-fire mortality mechanisms

Oral Presentation

Most process models of post-fire tree mortality are based on stem girdling (phloem and cambium necrosis). However, emerging evidence suggests that sapwood dysfunction is another important mortality mechanism. Sapwood dysfunction could even cause faster mortality than girdling, but this remains untested. Here I present results from stem heating experiments designed to test mortality mechanisms in isolation. Experiments were conducted on 120 saplings from each of three tree species (Populus tremuloides, Picea glauca, and Pinus contorta) assigned to one of six experimental treatments: control, manual girdle, manual sapwood area reduction, manual girdle plus sapwood area reduction, heat girdle, and heat girdle plus sapwood area reduction. Cox proportional hazards regression revealed that treatment (but not species or stem diameter) was a significant predictor of survival. Hazard ratios show that (i) sapwood dysfunction can occur as a result of stem heating, and (ii) heat-induced sapwood area reduction causes faster tree mortality than heat girdling. Consequently, process models for post-fire tree mortality can be improved via consideration of both sapwood dysfunction and girdling.

Miesel, Jessica

Jessica Miesel is an Assistant Professor in the Department of Forestry at Michigan State University. Her research focuses on soil ecosystem response to fire, and the contribution of pyrogenic carbon to above- and belowground forest carbon pools in fire-prone forests.

How does wildfire severity affect soil organic matter composition and dynamics in southern boreal forest?

Oral Presentation

Predictions of increased wildfire risk, size and severity raise concern about ecosystem resilience to extreme fire events. The 2011 Pagami Creek wildfire in northern Minnesota, USA affected nearly 40,000 ha of southern boreal forest and resulted in a range of soil burn severity levels in a mixture of forest cover types. We collected forest floor and mineral soil samples in 2011 and 2014 to evaluate the effects of fire severity and forest cover type on soil organic matter (SOM) composition and carbon (C) and nitrogen (N) dynamics. We investigated soil organic matter composition using 13C NMR, pyrogenic C characteristics using benzene polycarboxylic acid molecular markers (BPCAs), and carbon (C) and nitrogen (N) mineralization rates using field and laboratory incubations. We found that the effects of fire on organic matter composition were more pronounced in the forest floor layer than in the mineral soil and indicated a loss of carbohydrates and lignin and gain of pyrogenic C. N mineralization rates decreased in all burned areas, and differences among severity levels and cover type were not statistically significant. Results on C mineralization rates will be presented. Information on soil ecosystem processes will enable greater understanding of forest recovery patterns over time after fire.

Miller, Colton

Colton earned his master's in Forest Resources from the University of Washington in 2013, focusing in forest soils. Specifically, he researched methods to improve reforestation of a surface coal mine in Centralia, Washington. After receiving his degree, Colton worked for the Quinault Indian Nation as a pre-sale forest in the Bureau of Indian Affairs office, located on the Olympic peninsula. He returned to the UW in 2015 to pursue research opportunities in forest management and wildland fire science. He also works with the Center for Quantitative Science and serves as an officer for the Xi Sigma Pi Forestry Honor Society.

Evaluating wind patterns and potential burn days for prescribed fires outside Bend, Oregon

Oral Presentation

Due to increases in fire season length, frequency, and area burned in the western U.S., prescribed fires are increasingly important to reduce wildland fire hazards and improve forest health. However, smoke emissions from controlled burns may negatively impact air quality near populated areas. Meteorological data was collected at ten sites and particulate matter data at three sites in a generally north-south transect from Sisters, Oregon to Sunriver, Oregon, between October 2014 and June 2015. The sites border the Deschutes National Forest, where fuel reduction treatments in the wildland-urban interface pose a concern regarding smoke intrusions into Bend, Oregon. This study assessed the wind flow patterns and dispersion conditions surrounding Bend to inform burn managers in the Deschutes National Forest. Potential burn days were identified according to acceptable weather conditions. Additionally, the timing of wind flows was examined to determine if nighttime smoldering was possibly contributing to smoke reaching populated areas. For recorded smoke intrusions, or where particulate matter reached the sampling sites from prescribed fires, specific weather conditions were assessed. A tradeoff analysis identified the gain or loss in potential burn days associated with relaxing or restricting weather conditions for burning.

Miller, Van

Van V. Miller serves as a professor at Central Michigan University where he specializes in sustainability issues and the impact of human decision making upon them. His Ph.D. was earned at the University of New Mexico, and he was awarded a Fulbright Research Scholarship to Central America.

Which Values at Risk?

Oral Presentation

Wildland fire decision makers must confront two distinct problems in their incident command tasks—two incompatible decision making models, Recognition Primed Decision Making and Heuristics & Biases, and ambiguous notions of what values at risk entail. In previous presentations at wildland fire conferences (2013, 2014, and 2015), I have discussed the difficulties and challenges presented by the two models and offered an integrative model that overcomes some of the contradictions. In this proposed presentation, I intend to delve more deeply into the values at risk premise that underlies the decisions that incident commanders must make in their suppression activities. To analyze the values at risk notion, the Wildland Fire Decision Support System (WFDSS) will be reviewed and offered as evidence for how incident command teams perceive and judge values at risk. Then drawing from the field of sustainable development, three fundamental parameters—ecological, social, and economic—will be utilized to categorize forest-related values that may be at risk in a fire incident. Given that these parameters and accompanying values are not additive, The WF decision maker must choose among them, and in so doing, reveal his/her biases in decision making. Two wildland fires, the 2011 Las Conchas in New Mexico and the 2013 Papoose in Idaho, will be used to illustrate the three parameters and their revealed value sets.

Miller, Mary

Mary Ellen Miller is a research engineer at Michigan Tech Research Institute. She currently works with NASA and the U.S. Forest Service developing tools and datasets to rapidly integrate earth observations into hydrological models to support post-fire remediation. Her research interests include utilizing remote sensing data in physically based environmental models. She has a strong interest in fire science especially fire effects and mitigation. Recent projects include the development of a physical model of post-fire dry ravel, reducing noise in LiDAR waveforms for determining forest biometrics and prioritizing fuel reduction treatments.

Rapid response tools and datasets for post-fire modeling and fuels planning

Oral Presentation

Post-fire flooding and erosion can pose a serious threat to life, property and natural resource integrity. Land and water managers in fire prone areas need to quickly evaluate these risks and assess potential benefits derived from post-fire remediation or fuels treatments. Many modeling tools have been developed to assist post-fire remediation efforts, but process-based and spatially explicit empirical models are currently under-utilized compared to simpler, lumped models because they are difficult to set up and require properly formatted spatial inputs. To support both post-fire remediation and pre-fire fuels planning from a watershed perspective, we have built an online application that generates spatial model inputs for process-based and spatially explicit hydrological models. Our new web-application allows users to upload burn severity maps derived from forecasts to be used for fuels planning or from remote sensing to support post-fire remediation (http://geodjango.mtri.org/geowepp/). Automating the creation of model inputs facilitates the wider use of more accurate, process-based models for spatially explicit predictions of post-fire erosion and runoff. These predictions can then be used by managers to target the expensive treatments that are intended to reduce runoff and/or erosion to areas with the greatest downstream values at risk.

Miller, Carol

Carol Miller is a Research Ecologist with the Aldo Leopold Wilderness Research Institute in Missoula, MT. She is particularly interested in fire as an agent of landscape pattern formation and the scientific value of wilderness as a natural benchmark for change. Her program of research seeks to help land managers understand how to include wildland fire as an ecological process to landscapes.

The spatial and temporal variability of modern-day fire refugia in temperate forests of western Canada and the United States

Oral Presentation

The unburned and low severity patches left behind after a wildfire are thought to be important refugial habitats for fire-sensitive species and legacy seed sources for forest recovery after fire. Numerous studies have characterized the amount, configuration, and discerning features of these remnant post-fire forest patches, examined environmental drivers that lead to their formation, and investigated the conditions that contribute to their persistence. While these studies provide a growing understanding of post-fire refugia in particular landscapes, we lack a general framework for understanding how patterns of refugia, and their formation, vary with fire environment. We propose a conceptual model that organizes the formation of fire refugia across gradients of key environmental drivers. To provide a proof of concept, we analyze burn severity data for a set of case study fires from western Canada and the United States. The analysis shows how fire weather, topography, vegetation, and management legacies result in spatial and temporal variability in the distribution of refugia across forest-dominated landscapes. The analysis also reveals how the predictability and relative importance of these individual factors vary under different conditions. This proof of concept enhances our understanding of fire refugia, a prerequisite for crafting strategies for promoting resilient landscapes.

Miller, Steven

Steven R. Miller, Chief Land Management, St Johns River Water Management District Steve earned his BS in Forestry from the University of Wisconsin Stevens Point in 1985. He worked for the USDA Forest Service, Texas Forest Service, and Florida Forest Service. He is currently the Chief of Land Management for the St. Johns River Water Management District. He is responsible for directing a land management program on over 600,000 acres. Steve has experience in both prescribed fire and fire suppression. He serves as a Operations Section Chief. He is earning his MS in Ecological Restoration at the University of Florida. He is married and the father of two; one of whom is a second-generation forester/fire manager.

If Our National Response To The Polio Virus Followed The Same Course Of Action We Are Using In Our National Response To Wildfires, Would We Be Spending Billions Of Dollars On The Purchase Of Iron Lung Machines.

Oral Presentation

The first outbreak of polio in the US was in Vermont in 1894. By 1952, over 52,700 cases were reported. Once infected, little can be done to treat a patient. Severely affected patients, who do not die, typically spend the rest of their life in an iron lung machine. Because there were few treatment options once a patient is infected, the nation focused on preventing infection in the first place. Campaigns were waged to change behavior. Everyone from researchers, to doctors, to ordinary citizens and schoolchildren changed their behavior to reduce the risk of spreading the disease. The discovery of the vaccine in 1954 changed things dramatically. Scientists report that the investment of 36.7 billion dollars spent on preventing infection, eliminated 1.1 million cases of polio and saved the US 180 billion dollars. The US is facing a wildfire epidemic. Acres burned, homes lost, and money spent on fire suppression, continue to increase. Just like polio, prevention is more effective and the solution to the wildfire problem will require people to change their behavior. Continuing the current approach is to doom us to the equivalent of a life spent in an iron lung.

Miller, Colin

Colin Miller is a graduate research assistant at the University of Maryland, College Park. As a PhD candidate under the direction of Dr. Michael Gollner, his research is being funded by the USDA Forest Service Missoula Fire Sciences Lab. His current experiments focus on the fluid dynamics of wildland fires.

A Fundamental Exploration of Flame Structure in Wildland Fires

Oral Presentation

In the wildland environment, many fundamental features of flame spread remain unexplained. This work reviews several recent projects, including laboratory experiments and numerical simulations, which have begun to shed light on the flame spread process. An understanding of the three-dimensional structure of turbulent flames becomes very important in wildland fire spread, which is driven by convective ignition of fine fuels. Knowledge of the intermittent behavior of wind-blown flames may help us to properly determine the influence of these processes on wildland fire spread. In order to develop a thorough statistical analysis of flame structure, experiments and simulations on stationary heated plates and gas burners have been performed. Flame geometry and pulsating behaviors of both the visible flame and the incident heat flux have been examined. Additionally, dominant coherent structures in the form of streamwise streaks and spanwise waves are consistently observed along the flame front. Thermal and inertial quantities of these instabilities, which may drive the formation of the flame, have been quantified and scaled. The coupled roles of buoyancy, shear forces, and the boundary layer have been investigated in an effort to determine the mechanisms driving the development of a wind-driven flame.

Miller, Jay

Mr. Miller is responsible for analyzing region-wide fire severity data to characterize current fire regimes and fire severity patterns. He was a member of the national interagency Monitoring Trends in Burn Severity (MTBS) team in the development and implementation of mapping fire severity across the US. He was also a principal developer of the Rapid Assessment of Vegetation Condition (RAVG) program which is intended to support post-wildfire reforestation planning on National Forest lands. Mr. Miller has coauthored peer-reviewed journal articles on fire effects, fire effects mapping and analysis of landscape level fire patterns.

Pre-settlement vs. Modern Fire Regimes of the Sierra Nevada, California, USA

Oral Presentation

Land use practices and fire suppression policies have changed forest structure and impacted fire regimes in historically frequent fire forests across the western US. We compare pre-settlement and modern fire regime attributes for yellow pine/mixed conifer forests of the Sierra Nevada region of California. Fires on USFS lands during the early 20th century and Yosemite National Park's use fires 1980-2012 >121 ha were 4-7 times more common than late 20th century fires over the wider study area. However, area burned at high severity over the past few decades may be within the range of estimates for pre-settlement forests. Also, total area mapped as montane chaparral, an early seral condition, has not substantially changed in recent vegetation maps compared with early 20th century maps. If total high severity burned area were spread over 4-7 times more fires, then each fire would need to average only 4-8 % to cover the same total area, which is close to some estimates for pre-settlement fires.

Transition state modeling also demonstrates that if the proportion of high severity in modern fires was typical during pre-settlement times, only a small proportion of pre-settlement forests could have been in old-growth condition.

Miller, Becky

Becky Miller is co-principal investigator of the Malheur National Forest CFLRP Forest Vegetation and Fuels Monitoring Program. She is a first generation college graduate, earning her B.S in Bioresource Research from Oregon State University and currently works for the Wildland Fire Lab in OSU's College of Forestry. She has conducted several independent research projects, most notably investigating relationships between intra-canopy microclimate and phenological response of Douglas-fir trees. Her current work with the Malheur National Forest exemplifies the dynamic and highly successful collaborative effort between community stakeholders, the USFS and private forest managers in the Southern Blue Mountains.

Innovative Strategies for Achieving Collaborative Forest Landscape Restoration Program (CFLRP) Objectives in the Southern Blue Mountains

Oral Presentation

The Canyon Creek Complex burned more than 80,000 acres on the Malheur National Forest (MNF) in eastern Oregon in 2015. The fire burned during the third year of an ambitious 10-year landscape-scale forest restoration program undertaken with funds from the Collaborative Forest Landscape Restoration Program (CFLRP). CFLRP is a Congressionally authorized program supporting collaborative, science-based ecosystem restoration. MNF managers are using mechanical thinning and prescribed fire to create resilient forest landscapes across approximately one million acres of Forest Service lands. CFLRP funds also support an exemplary multi-party, interdisciplinary monitoring program investigating the socio-economic and ecological effects of restoration treatments. Collaborators, including the Blue Mountains Forest Partners, MNF, and Oregon State University, have completed two years of data collection that informs adaptive management, generates baseline data to monitor long-term change, and provides information directly applicable to emerging questions. We will describe the monitoring protocols being used and provide preliminary answers to a variety of questions including: 1. How do treatments influence fuels and fire behavior? 2. How do treatments affect forest structure, composition and function? We will also share preliminary information about the effects of the Canyon Creek Complex fire and its impact on present and future CFLRP efforts.

Mobley, William

Will Mobley is a doctoral student in the Urban and Regional Science Program in the Department of Landscape Architecture and Urban Planning at Texas A&M University at College Station. He is a research assistant in the Institute for Sustainable Coastal Communities. His research interests include: ecosystem management, wildfire mitigation, and geospatial analysis.

Effects of Development on Wildfire Risk

Oral Presentation

Various development patterns affect wildfire risk differently. While these development patterns are difficult to parse out individually, collectively they can be characterized by two different trends: diffusion and coalescence. Development dominated by external patches indicates diffusion; while development dominated by combining distinct patches indicates coalescence. This project investigates how the alternate patterns of diffusion and coalescence affect fire risk. I examine the Dallas-Fort Worth metropolitan area during the years of 2000 and 2010. The types of risk assessed include ignition location (logistic regression), burn probability, and intensity (MTT fire simulation). I hypothesize that diffusion patterns will have a higher burn probability in the study area, while coalescence will have higher ignition probability. I also test whether a diffusing landscape will have more fire risk variation than a coalescing landscape. This project will help planners and fire managers understand the degree to which fire risk depends on development patterns across the landscape and offer insights into how to develop communities that minimize fire risk over the long term.

Molina-Terrén, Domingo

Domingo Molina studied in Universidad Politécnica de Madrid and, later on, at University of California, Berkeley obtaining MSc and PhD degrees in Wildland Resources Science. He has more than 25 years of experience in wildland fire issues. His areas of expertise include Fire Ecology, Fie Management, Prescribed Burning Use, and Job Hazard Mitigation Actions. He has been involved in many different counties in teaching and research. Many courses, classes and seminars in: California (USA), Idaho (USA), Florida (USA), Montana (USA), Italia (Padova; Sassari, Cagliari y Nouru en Sardinia; Firenze, y CENTRO ADDESTRAMENTO REGIONALE AIB, Regione Toscana), Grecia (MAICh, Creta), Francia (Avignon, INRA; Oloron, Pirineos Atlanticos, Servicio de Bomberos), Bélgica (ULB), Austria (Viena, BOKU), Portugal (Coimbra, Vila Real, Lisboa, Mancomunidad Municipios Alto Minho), Germany (Global Fire Monitoring Center and University of Friburg, Freiburg), Andorra (CENMA, Sant Julia de Loira), Brazil (Curitiba) Argentina (Esquel, Puerto Martyr). D. Molina has been part of three large European Research Projects (as University of Lleida team leader): Fire Torch (4th FP, Prescribed Burning: a silviculture tool), EUFireLab project (5th FP, www.eufirelab.org), and Fire Paradox Project (www.fireparadox.org, http://ec.europa.eu/research/fp6). He has been acting in the steering committee in EUFireLab and in the Board of directors in Fire Paradox. D.M. Molina is the director of masterFUEGO (Master of Science in Wildland Fire Science and Integrative Management) that is an official master program (under the Spanish Ministry of Education) and it is carried out with two other Spanish Universities as minor partners (University of Lleida and University of León). D.M Molina has been part of the 2013-16 For Burn. Presribed Burning Research Project: repeated burns and older burns. Ministry of the Environment and Competitiviness, Spain. ForBurn Ref: AGL2012-40098-CO3-01.

Fire spread patterns, extreme weather conditions and wildfires

Oral Presentation

Understanding instrumental factors dealing with the development of large wildland fires is a need. Fire spread typologies, extreme temperature days and their relationships with wildland fires were studied in the 1978 2012 period in Aragón (NE Spain). Temperature was examined at 850 hPa to characterize the low troposphere state and wildfires were characterized in three fire spread typologies: convective fires, wind-driven fires and topography-driven fires. The number of high temperature days increased significantly along the study period, growing the frequency of adverse weather conditions. The effects of those high temperatures days in larger wildland fire patterns were significant in terms of burned area, number of wildland fires and average size. Wildland fire propagation typologies were also analyzed and convective fires burned the majority of total area burned and resulted the larger and the most closely typology related to HTDs. Drought Code interaction with HTD and their effects, as well as wildland fire size were studied too.

Wildland fire use (prescribed fire and suppression fires) in Southern Europe and Latin America

Oral Presentation

Wildland fires presents a challenge to natural resources managers all over South Europe and Latin America, and the intentional setting of fires (“prescribed” burning) can be used to alleviate some of the challenges associated with wildfire management. Prescribed burning can be used prior to wildfires, to reduce fuel loads and promote ecological integrity in fire-adapted systems, or counter fires can help firefighters control the direction, extent, and intensity of wildfire behavior. In both cases, the success of prescribed fire use depends on training, knowledge, experience, and institutional and social support for prescribed burning. The influence of these factors can significantly impact whether fire use is perceived as positive or negative, increasing or decreasing, and whether managers are supportive of its incorporation into their management decision-making and planning. Perceived impediments to fire use are likely to differ based on location, level of training and experience, and even the culture of fire management specific to different job positions in natural resource management. In order to explore how managers and stakeholders across the world perceive prescribed fire use, we surveyed over 700 respondents from 12 countries and 3 continents. This study represents the largest survey of perceptions on prescribed fire ever conducted. Perceptions differed across age categories, job positions, and regions. Countries or regions with higher levels of wildfire acreage burned tended to be more supportive of fire use in suppression, while countries with less wildfire had less positive perceptions of fire use for either prevention or suppression. Bureaucracy and social perceptions were identified as impediments to using prescribed fire for fuels reduction (i.e. prevention), but neither were identified as impediments to fire use during suppression procedures. Across the countries, fire use in suppression was viewed more positively than fire use in prevention.

Moore, Elizabeth

Elizabeth Moore is a Masters of Environmental Management candidate at Western State Colorado University and is focusing in Integrative Land Management. She is studying the effects of piñon-juniper forest management in the wildland-urban interface. She holds a B.A. in Environmental Studies and Geography from the University of Colorado at Boulder (2008) and has been practicing vegetation community research and public land management throughout the Colorado Plateau, Great Plains, Great Basin, and Pacific Islands, with a focus in invasive plant ecology and restoration.

Invasive Plant Proliferation and Persistence Following Fuel Treatment Projects in Piñon-Juniper Woodlands

Student Poster Presentation

Piñon-juniper woodlands form the wildland-urban interface for many communities in the western U.S. Hand-thinning and hydro-ax mastication are frequently employed to reduce fire hazard in these settings; however, understory plant community responses to these projects are not well understood. The goal of this research is to assess the effects of treatments to understory vegetation, particularly the risks of expansion by invasive, exotic species. We characterized plant community composition in 116 sites that had undergone fuel treatments during the past 12 years and an equal number of untreated controls in upper Arkansas River valley piñon-juniper woodlands in central Colorado. We used point-line intercepts to measure understory species and ground cover, including woody fuels. We found higher vegetation cover in treated sites with much greater abundance of non-native species. Even 12-years post-treatment, masticated sites were characterized by piles of wood chips surrounded by non-native invasive annual plants, predominantly cheatgrass (Bromus tectorum), Russian thistle (Salsola tragus), and tall tumblemustard (Sisymbrium altissimum). Modern treatment strategies for fuels management in piñon-juniper woodlands may unintentionally result in altered and undesirable ecological impacts. Additional research is necessary to assess whether these impacts can be effectively mitigated, and develop recommendations for science-based land management.

Moranz, Raymond

Dr. Raymond A. Moranz is a visiting assistant professor in the Department of Natural Resource Ecology and Management at Oklahoma State University. In a 2014 paper in the journal "Biological Conservation" (Vol. 173, pp. 32-41), Ray and his colleagues Sam Fuhlendorf and Dave Engle demonstrated significant effects of fire and grazing on an imperiled prairie butterfly species and some of its preferred food sources. In the paper, they discussed how a positive indirect effect of fire (i.e. increased floral production of some preferred nectar sources) might offset the negative direct effects of fire on this species.

Understanding the effects of wildland fire on North American butterflies

Oral Presentation

In this presentation, I provide a review of some recent research on the direct and indirect effects of wildland fire on butterfly populations in North America. Direct effects, when demonstrated, have been negative. However, whether or not butterflies are killed by fire is highly context dependent, with key factors being the life history of the focal species, fire timing, fire extent, and whether or not the fire is complete or patchy. Fire can affect butterfly populations indirectly, particularly through its impacts on host plant abundance, nectar source abundance, and vegetation structure. Indirect effects of fire are often positive. I will summarize some recent findings of others, including those on Fender's Blue Butterfly in the Pacific Northwest. I will present findings from tallgrass prairies of the central United States, where some rare butterfly species exhibit both positive and negative responses to fire. I will also describe fire effects on some prairie forbs that serve as nectar sources and/or host plants, including plants important to the conservation of the declining monarch butterfly.

Morfin, Victor

Victor Morfin Forest Fuels Specialist Coconino National Forest He attained his Master of Science Degree from Northern Arizona University while studying changes in composition and structure in Ponderosa Pine/Douglas-fir stands on the Colville Indian Reservation.

The Sitgreaves Fire- a case study describing a successful outcome.

Oral Presentation

The Sitgreaves Fire started on the Williams RD of the Kaibab NF on July 14, 2014. Challenges included Interstate 40 and multiple houses adjacent. Mexican Spotted Owl and Northern Goshawk habitat, significant Heritage Resource Values and an ongoing research project was located within the proposed fire perimeter. The fire was burning on the steep slopes of Sitgreaves Mountain in Ponderosa Pine that had not burned in over 100 years. In addition, the fire was located in an area where spread could not be directed or stopped- it was all or nothing. Despite these factors, leadership chose to manage the fire for resource objectives rather than simply suppress it. In the end, highlights included low aviation and firefighter exposure, low cost and favorable fire effects. Metrics of these highlights include less than 1 mile of fireline constructed, no aviation suppression missions, a cost of about $58/acre and less than 4% burnied under high severity (RAVG data). For comparison, the Eagle Rock fire burned on the same mountain and adjacent in June 2010- it had hundreds of hours of aviation operations, over 5 miles of handline constructed on steep slopes in heavy timber, cost $866/acre and had about 54% high severity.

Morgan, Penelope

Penelope Morgan is a Professor in the Deaprtment of Forest, Rangeland, and Fire Sciences. There she teaches Fire Ecology, Prescribed Burning, and Science Synthesis and Communication. Penelope's research focuses on fire ecology. She's been at the University of Idaho since 1986. She is on the steering committee for the Northern Rockies Fire Science Network and the advisory committee for the Great Basin Fire Science Exchange.

Fire behavior in masticated fuels burned in lab and field experiments

Oral Presentation

Uncertainty about fire behavior in masticated fuels drives our replicated combustion lab and prescribed burning experiments focused on fuelbed age (1 and 2 yr) and moisture content. Each year we burned 75 plots in 3 replicate 30-yr-old ponderosa pine stands thinned with a mastication head on a CAT 320B excavator. Mastication removed 30-72% of trees, leaving a mean of 367-492 trees/ha. Burned fuelbeds varied in loading (4.5 to 14.4 kg m-2) and depth (8.1 to 13.7 cm); fuels were compact, shredded, irregular pieces (10-22% 1-hr, 45-60% 10-hr and 7-13% 100 hr in yr 1) with bark, needles (litter 13-25% of total fuel weight yr 1), and resprouting shrubs (year 2). Needles facilitated ignition and spread. In lab experiments, fuelbeds of the same fuel and fuel depths were burned under a wide range of fuel moisture. Lab results are useful in predicting flame length, rate of spread and fuel consumption, suggesting that scaling is practical. However, slope, wind, and other local conditions will alter fire behavior. We developed custom fuel models and FCCS fuelbeds for mastication by incorporating USFS research and data from another project also funded by JFSP. Results will inform local managers who increasingly use mastication to control fuels.

Morgan, Penelope

Penny Morgan is a Professor in the Dept. of Forest, Rangeland, and Fire Sciences at the University of Idaho. There she teaches Fire Ecology, Prescribed Burning, and Science Synthesis and Communication. Penny's research focuses on fire ecology. She's been at UI since 1986. She is on the steering committee for the Northern Rockies Fire Science Network and the advisory committee for the Great Basin Science Exchange.

Harnessing the Power of Fire to Change Landscapes

Oral Presentation

We will have more large fires. How can we consider their ecological benefits in fire management decisions seeking to balance those with protecting people, property and other values and risk from fire and smoke? We have learned that a) burn severity varies greatly when large fires burn in complex terrain, and this heterogeneity often benefits ecosystem recovery from fires, and b) proportion burned severely is poorly correlated with daily area burned. Managers can and should foster patchiness ("holey fires") by taking advantage of complex terrain and managing fires to burn under variety of environmental conditions. We have a "fire deficit" of areas burned under less extreme conditions. Further, size and burn severity are often limited by prior fires both within and beyond wilderness. How then do we harness (as appropriate) the power of fires to change landscapes and help ecosystems and people adapt to changing conditions? I recommend a) using tools projecting probability of severe fire (soon available in WFDSS), b) making and supporting decisions that include less aggressive suppression (can sometimes save money and put fewer fire fighters at risk while meeting land management objectives, and c) fostering conversations about living with fire.

Morici, Kat

Kat Morici is a Graduate Research Assistant and MS Candidate at Oregon State University. She worked for the National Parks Service and Bureau of Land Management wildland fire programs prior to entering graduate school to further study fire ecology and management.

Fuel Treatment Longevity in the Blue Mountains of Oregon

Student Poster Presentation

Fuel treatments are designed to reduce extreme fire behavior, promote resilient forest structure, and facilitate fire control efforts. Repeated treatments are needed to maintain desired conditions, and longevity is likely to vary with forest type and treatment approach. The Blue Mountains Fire and Fire Surrogate study site in northeastern Oregon was a prime candidate for re-measurement of a ponderosa pine and mixed conifer forest. In 1998, sixteen units were assigned to four treatment groups: mechanical thin, prescribed burn, both thin and burn, and control. The primary research question is: How does fuel loading and understory vegetation composition vary between fuel treatments, measured 15-17 years post-treatment, in the Blue Mountains of northeastern Oregon? Treatment longevity can be examined by comparing pre- and post-treatment stand structure, fuel loading, and understory vegetation. My hypotheses are: 1) fuel reduction effects persist, but fuel loading is higher now than directly after treatment; 2) prescribed fire increases cover of grass and forbs; 3) shrubs are more prevalent in untreated units; and 4) invasive plant species cover is correlated with treatment intensity. Quantifying persistent changes in fuel loading and understory vegetation aids in the planning of future fuels treatments, along with scheduling maintenance of existing treated areas.

Mueller, Eric

Eric Mueller is a PhD student at the University of Edinburgh, BRE Centre for Fire Safety Engineering. Having completed a B.S. in engineering physics (Tufts University) and a M.S. in fire protection engineering (Worcester Polytechnic Institute), with a focus on wildland fires, he joined the program in 2013. His research is focused around the testing and improvement of physics-based numerical models of fire behavior. His additional research interests include the development of accurate and robust techniques for in-situ experimental measurement of fire environments, as well as methods for quantifying the generation of firebrands.

Localized fire behavior regimes in a field-scale experiment

Oral Presentation

The development of a strong scientific understanding of the physical phenomena that drive wildland fires is required to improve our understanding of these events. This is particularly necessary for the assessment and improvement of tools used in the modeling of fire behavior. As wildland fire events involve processes which occur across a wide range of length and time scales, measurements at the field scale are critical not only to illuminate the characteristics of a particular fire, but also to inform the conditions selected for detailed, controlled laboratory studies. In this work, a suite of instrumentation was developed to provide detailed measurements of temperature, heat flux, and local wind at different sites within one experimental fire. The fire, conducted in the Pinelands National Reserve of New Jersey, has been previously evaluated in terms of general fuel consumption and spread characteristics, thus providing context for the point measurements discussed here. These localized measurements highlight the different conditions possible in a single fire. A comparison is made between a region of spread in predominantly shrub fuels and a region involving significant canopy fuel consumption, allowing insight into the controlling phenomena. The results presented here provide good comparison points for physics-based fire behavior models.

Nelson, Kurtis

Kurtis Nelson is a physical scientist with the US Geological Survey. Kurtis is the USGS technical lead for the LANDFIRE Program. His has extensive experience using remotely sensed data for mapping vegetation, wildland fuels, and burned areas. He has several publications detailing algorithms and results of LANDFIRE disturbance mapping and data updating processes.

Quantitative validation of preliminary Burned Area Essential Climate Variable data products

Oral Presentation

The US Geological Survey is developing several Essential Climate Variable (ECV) data products, including data that represent annual burned area based on Landsat imagery. The Burned Area ECV (BAECV) team produced preliminary data products for the conterminous US for the years 2011 and 2012 and provided them to the LANDFIRE program. The program performed a quantitative validation of the data products and an evaluation of their potential use for mapping fire disturbances to update LANDFIRE data. The annual burned area raster products were converted to a vector format for five geographic areas based on the training areas for the BAECV models. Individual fire perimeters were stratified by fire size and samples were randomly selected in each size class, in each geographic area, per year. The perimeters were visually inspected against Landsat and high spatial resolution imagery to determine errors of commission. LANDFIRE wildfire disturbance data were also converted to a vector format and stratified on the same basis as the BAECV data and inspected in the same way to determine errors of omission in the BAECV products. Statistical summaries of the results and common error types within each area were provided to the BAECV team to help improve their algorithms.

Nemens, Deborah

Deborah Nemens, Graduate Research Assistant, Virginia Tech. Deborah has been working in the fields of ecological restoration and habitat conservation for more than ten years. During that time, she has been involved in a number of ecological fire programs across the country.

California black oak resprouting across recurring fire severity gradients

Student Poster Presentation

Oak communities in the western United States have been in decline since the advent of large-scale fire exclusion in the early 20th century. In the absence of fire, woodlands that formerly supported oaks and the wildlife dependent on them are increasingly dominated by shade-tolerant conifers that encroach on remnant oaks, reducing oak vigor. One potential avenue for restoration of California black oak (Quercus kelloggii) in mixed-conifer forests is via resprouting following high severity fires. We examined California black oak sprout vigor across a spectrum of fire severities following two mixed-severity wildfires that burned over approximately the same landscape in 2000 (Storrie Fire) and again in 2012 (Chips Fire) in the Lassen National Forest in northern California. Ninety-six plots were established across the landscape burned by both wildfires. Six plots were established in each of 16 Storrie-Chips fire severity combinations, ranging from unburned to high-severity. Over ninety-five percent of oaks that sprouted following the Storrie fire and were top-killed in the Chips fire resprouted. Sprout vigor was greatest in the moderate and high severity strata and diminished in sites that burned with the lowest severity. Our results will enable managers to prioritize restoration actions after wildfires in mixed conifer-oak communities.

Newingham, Beth

Dr. Beth A. Newingham, Research Ecologist, USDA Agricultural Research Service. Dr. Newingham has contributed to wildland and prescribed fire research, education, and training in both academic and governmental settings. Her research focuses on post-fire ecosystem recovery and restoration in desert and forested ecosystems.

What's still hot?: Cross-ecosystem diversity responses a decade after fire

Oral Presentation

The intermediate disturbance hypothesis predicts plant diversity to be highest after fire with moderate burn severity. Previous studies have found variable effects of burn severity on plant diversity in the short-term; however, little is known about long-term (~10 years) plant community responses to burn severity across community types. We examined decadal diversity responses to fire across seven fires in conifer/oak/chaparral, ponderosa pine, and mixed coniferous (dry and moist) forest ecosystems. Percent cover of each species was determined via ocular estimation at sites within each fire across gradients of burn severity, elevation, and aspect. Diversity across and among functional groups (forb, grass, shrub, tree) was estimated using Hill numbers. Although burn severity did not affect grass or tree diversity, it significantly increased forb and shrub diversity. Shrub diversity was also affected by the interaction among burn severity and elevation. Tree diversity was primarily affected by the abiotic factors of elevation and aspect. Our data suggest that 1) not all functional groups respond similarly to burn severity, elevation, and aspect, and 2) the effects of burn severity, elevation, and aspect are still realized a decade after fire. These results provide well-needed information on long-term effects of fire on plant diversity.

Nguyen, Dung

Dung Nguyen is a PhD candidate (defended in summer 2015) in Forest Science at Colorado State University. His research focuses on developing quantitative and spatially explicit model to support decisions in forest resource management, hazard fuel reduction, and wildland fire suppression. He is particularly interested in designing and analyzing tradeoffs between different spatial and temporal management schedules with concerns of sustainable forest planning and efficient fire management under the influences of uncertainties of weather, natural disturbances, and management operations. He can be contacted at: dzung.csu@gmail.com.

Develop a multistage stochastic program with recourse for scheduling prescribed burning based fuel treatments with consideration of future wildland fires and fire suppressions

Oral Presentation

In this study, I present a multistage stochastic linear program with recourse for scheduling prescribed burning based fuel treatments under the influences of random future windland fires and fire suppressions across multiple planning periods. Prescribed burning decreases future wildfire's spread rate and intensity. Future wildfire uncertainties are characterized by sequences of independent and identical (i.i.d.) fire samples across the entire planning horizon. Each simulated sample fire ignites at a random location and spreads for a random duration under the influence of a randomly selected wind direction and speed. This stochastic program explicitly addresses the spatial and temporal relationships between fire behavior, prescribed burning, and suppression in multiple fire-planning periods. It uses sample average approximation and minimizes the sum of average discounted management cost plus average discounted fire loss across a planning hori zon. Test cases are designed to examine fire-and-management situations on an artificial forested landscape, and are focused on selecting good quality first period prescribed burning locations. Results provide a wide range of optimal solutions for allocating the first period prescribed burning to handle risks from future wildfires.

Nichols, Tom

Tom began his career in 1977 in Sequoia and Kings Canyon National Parks as a fire effects monitor. In 1992, he transferred to the NPS Regional Office as the Prescribed Fire Specialist, and was promoted to Regional Fire Management Officer in 1997. From 2002 to 2005, he was the Fire Management Officer for Yosemite National Park. In 2005, he transferred to the National Interagency Fire Center in Boise, Idaho, and in 2007 became NPS Chief of Fire and Aviation Management, retiring in 2014. Tom is the only person to have been a NPS unit, regional, and national Fire Management Officer in one career.

From Blazing Heritage to Faded Glory: Comments on the History and Current State of the National Park Service Fire Management Program

Oral Presentation

The National Park Service's fire management program has a well-deserved reputation for innovation. It began to allow natural fires to burn in the 1960's and widely incorporated the use of prescribed fire in the 1970's, changing its policies to do so. It developed prescribed burn boss courses, qualifications, and task books; fire effects monitoring protocols and crews; smoke management courses; Burned Area Emergency Rehabilitation teams; fire management plan templates; and mobile fuels crews for prescribed and natural fire projects. Yet, in spite of significant increases in funding and staffing due to the 2000 National Fire Plan, the implementation of the prescribed fire and natural fire portions of the program has ebbed; in 2014, only 83,105 acres were treated with prescribed fire, and parks continue to suppress many wilderness fires. The reasons why increased financial support for such an innovative program did not result in a proportional and general increase in acres of ecosystems restored and maintained with fire are many and subtle, and go well beyond the usual suspects of funding cuts, risk aversion, and drought. Solutions to improve the program's performance include redefining and strengthening the role of fire ecologists and resource management staff in the fire management program.

Norman, Steven

Steve Norman is a Research Ecologist with the USDA Forest Service's Southern Research Station in Asheville, NC. His current work addresses long-term changes in fire regimes and management and how they relate to landscape resilience.

Monitoring seasonal fire niches with large phenological and fire datasets

Oral Presentation

Fire regimes normally exhibit strong seasonality that is sensitive to climate, land surface phenology (LSP), ignitions and fuels. While considerable attention has been afforded to how fire regimes respond to climate, ignitions and fuels, the ties between LSP and fire are poorly understood even where the fire season is generally confined to a few months of the year. In the eastern US, the timing of phenological transitions is sensitive to variation in temperature and drought; ignition success and fire spread are often restricted by the higher moistures and lower wind speeds associated with the growing season; and fuels often change with senescence and leaf fall in deciduous forests and grasslands. In much of the West, LSP controls differ, but they are also present. Given that LSP is monitored by satellite, it provides an integrated measure linking top-down and local fire regime controls. Here we describe how historical fire occurrence has varied seasonally in concert with climate and MODIS-derived phenological gradients across the US since 2000. We describe the limits of LSP influence and how predicted changes in climate and the growing season may impact future fire seasonality.

High frequency monitoring of fire regimes and ecological resilience across the Okefenokee National Wildlife Refuge

Poster Presentation

The 438,000 acre Okefenokee National Wildlife Refuge in Georgia, USA harbors vegetation, fuels and fire regimes that are more difficult to monitor than those of other landscapes. Since 2000, large long-duration fires have burned over the Refuge three times with smaller fires occurring in other years. Drought periodically lowers the water table which exposes peat to burn. The resultant intense, large scale, smoldering fires can influence successional dynamics. As fire was historically thought to have been a less important disturbance than what it has become, future drought combined with a fire regime dominated by large fires may lead to a widespread and progressive erosion of ecological resilience, yet the remoteness of this landscape makes local monitoring difficult. This research demonstrates use of weekly MODIS NDVI time series to describe how and where areas are changing in response to multiple fires since 2000. Using measures of Land Surface Phenology, we describe and map immediate fire and drought effects, vegetational responses at high temporal resolution, and the cumulative effects of climate and fire regimes since 2000. This technology provides a systematic, regularly updated, landscape-wide tool for habitat characterization and monitoring.

Noss, Reed

Reed F. Noss is Provost's Distinguished Research Professor at the University of Central Florida. He has served as Editor-in-Chief of Conservation Biology, President of the Society for Conservation Biology, and is an Elected Fellow of the American Association for the Advancement of Science. He has more than 300 publications, including seven books. His latest book is Forgotten Grasslands of the South: Natural History and Conservation (Island Press, 2013). He is currently working on a book for the University Press of Florida: Fire Ecology of Florida and the Lower Southeastern Coastal Plain.

FIRE HISTORY OF A CENTRAL FLORIDA PINE SAVANNA LANDSCAPE

Oral Presentation

The frequency and seasonally of past fires are largely unknown for central Florida and are of interest to current fire managers. We investigated historic fire regimes of longleaf pine savannas in the Avon Park Air Force Range (APAFR), the last large, mostly-intact natural landscape along the Central Florida ridge. Using tree ring analysis, we examined how frequency and seasonal timing of fires changed over time in relation to human settlement and land use in the region during the period of 1784-2005. Fires were extremely frequent with mostly 1-3 year intervals over the entire period of record. Longer three-year interval, lightning-season fires were dominant before 1930 and 1-2 year interval, dormant (outside the lightning season) fires were dominant after 1930. The recent change to slightly less frequent fires and more dormant time-of-year burning likely has affected the plants and animals that evolved with a fire regime of more frequent, lightning-season fires. This fire history study provides scientific data (on frequency and time of year of fires) that can be used to help guide ecologically-based fire management of APAFR and other fire-frequented habitats.

Fire Seasonality in the Southeastern U.S. Coastal Plain: Should Managers Mimic the Lightning Fire Season?

Oral Presentation

Fire has shaped the evolution of species since the origin of land plants. The Coastal Plain of the southeastern U.S. is one of the most fire-prone regions on Earth, and fire appears to be ancient here. Components of a fire regime include frequency, seasonality, intensity/severity, patch size, and heterogeneity. Whereas fire managers largely agree about the importance of frequency and to some extent intensity/severity in prescribed burning, the question of the appropriate season(s) to burn is controversial. If fire during the evolution of species in a region was concentrated in a particular season, then species should have evolved mechanisms of growth and reproduction that respond to seasonal cues; they should experience greater fitness when burned during this season. A few species have been documented to show this expected pattern, but the effects of fire season on most species is still unknown. Moreover, fire season is confounded with other variables such as intensity, which may impact fitness more directly. Nevertheless, historical evidence shows that fire in the region was concentrated in the early growing season. Although practical considerations may often dictate burning outside this dominant lightning fire season, a precautionary approach would attempt to concentrate most prescribed burns within this season.

Nowacki, Gregory

Gregory Nowacki is the Regional Ecologist for U.S. Forest Service at the Eastern Regional Office located in Milwaukee, WI. He has written extensively on oak-fire relations in the eastern United States, including mesophication. The research presented here represents a continuation of this important work.

The use of witness trees as pyro-indicators in the eastern United States

Oral Presentation

Witness trees provide information fundamental for restoration ecology, often serving as baselines for forest composition and structure. Curiously, the use of witness trees to better understand past disturbance regimes remains largely untapped. In response, we have developed a technique by which witness trees are classified by fire relations then applied to spatial databases, thus converting witness-tree point data to a contiguous surface of pyrophilic percentage. In mountainous West Virginia, pyrophilic percentage was strongly related to climate and elevation, with fire being historically important in warm, dry valleys and orographic rain shadows and relatively unimportant on cool, wet upper slopes and ridges. When applied to New England, a distinct east-west line dividing areas of high (south) and low (north) pyrophilic percentage was apparent. Known as the Tension Zone Line, the undulating character of this boundary, penetrating northward along major river valleys, underscores the importance of Native Americans as a disturbance agent on the presettlement landscape. In Minnesota, fire breaks associated with water (lakes, rivers and peatlands) and broken topography had a profound effect on the spatial distribution of pyrophilic percentage. The use of witness trees as pyro-indicators adds another dimension to witness-tree interpretation and improves our understanding of past disturbance regimes.

O’Brien, Joseph

Joseph O’Brien is a research ecologist is a Research Ecologist and Fire Team Leader with the USDA Forest Service Center for Forest Disturbance Science in Athens, Georgia. His work focuses on the ecophysiological effects of fire and other disturbances on forest ecology, with a special interest in tropical ecosystems. He also is actively employing remote sensing techniques to examine fine scale fire behavior and its links to plant community ecology and forest structure.

Physiological responses of southern pines to fire: synergy among above and below ground damage.

Oral Presentation

The physiological effects of fire damage on canopy trees often triggers synergistic interactions that can drive delayed mortality. For example, root damage can impact the recovery of a scorched canopy and lead to a decline spiral that ultimately leads to tree death by insects. Though the insects are the proximate cause of mortality, the inability to supply water to the crown is the ultimate cause of the mortality in the latter example. We examine patterns of tree damage and their potential synergies in southern long needled pines that are adapted to frequent fire and contrast these responses to species with other life history strategies. For example, the fate of recent photosynthate could be linked to adaptations or the lack of adaptations to crown scorch.

Why frequently burned pine ecosystems are susceptible to catastrophic shifts in ecological regimes

Oral Presentation

In many fire dependent pine forests, the pines are foundation species because they not only dominate the overstory, but they also provide critical fuels that maintain the fire regime. The loss of these overstory pines and the subsequent interruption in fire from lack of fuels can result in a rapid shift in plant community structure and function. We present two examples of the impact of pine overstory loss on ecosystem structure and function in neotropical pine forests in the Turks and Caicos Islands and the Florida Keys. In the case of the Turks and Caicos pines, an invasive insect pathogen introduced in the early 2000’s resulted in the loss of >95% of the overstory by 2009. In the Florida Keys, a hurricane storm surge in 2005 resulted in high pine mortality nearly instantly. The ensuing loss of pine-derived fine fuels has resulted in conditions where fire will not carry across the landscape without management intervention. The timing of this intervention is critical and represents a tipping point where the ecosystem can shift towards a state where restoration of the fire dependent plant community will be difficult, impractical, or impossible.

O’Connor, Christopher

Kit O’Connor is an Ecologist with the USFS Rocky Mountain Research Station in Missoula, Montana working on the human dimensions of fire and forest changes resulting from land management and changing climate. His current projects involve support for the Wildland Fire Decision Support System and stakeholder engagement promoting proactive management to reduce wildland fire risks. In a series of publications from Sky Island Forests of Arizona, Dr. O’Connor documented the divergence of 21st century fire size and severity from 400 years of historical precedent and the influence of fire suppression on spruce beetle outbreak size and severity.

Projected impacts of climate change on vegetation and fire in the Huachuca Mountains of Arizona

Oral Presentation

The American Southwest is expected to experience temperature increases and reductions in winter precipitation over the next several decades. These rapid climatic changes will influence forest species distributions and fire activity; with implications for human safety and sustainability of ecosystems. To assess the influence of projected climate on vegetation and fire dynamics in this sensitive region, we conducted a landscape simulation of the Huachuca Mountains of Southeastern Arizona. We used a regionally downscaled ensemble of three Global Climate Models to drive simulations of vegetation and fire dynamics in the forest process model FireBGCv2. Results suggest a significant reduction in plant biomass, including the loss of large diameter conifer and aspen forests and conversion to Madrean oak and shrubland species. Changing climate is likely to increase the risk of high-severity fire in the short term, however the loss of biomass associated with these fires and increasing occurrence of persistent drought may function as a negative feedback on future fire spread. While fire suppression and fuel reduction treatments did not slow the rate of biomass loss, fuel modification in conjunction with fire use may promote longevity of legacy forests while retaining sensitive wildlife habitat.

O'Leary, Donal

Donal O'Leary is a kayaker, climber, software developer, former Emergency Medical Technician, amateur chef, pro-bono bike mechanic, Teaching Assistant, and M.S. Geography student at Western Washington University. After six years of building trails and coordinating volunteers in Saguaro, Yosemite, and Rocky Mountain National Parks, Donal completed his Bachelor's of Science in Watershed Science and GIS at Colorado State University, graduating Magna Cum Laude. Donal learned a lot about agricultural fire management and satellite imagery on his bike ride from Vancouver to Panamá, and is developing methods for using GIS in multivariate environmental analysis and climate change research.

Investigating the spatio-temporal relationships between snow melt timing and wildfire occurrence in the US Mountain West

Oral Presentation

Do bad ski years lead to big fire years? In this exploratory analysis I compare the Monitoring Trends in Burn Severity (MTBS) fire history data product with the National Snow and Ice Data Center's MOD10A2 weekly snow presence maps to identify spatial and temporal correlations between snow melt timing and wildfire occurrence. I use Python scripting to automate GIS processes and implement a novel change detection algorithm to develop new snow melt timing maps for the Western US. To describe this development process I produced several interesting maps, videos, and visual aids to explore and communicate the many processes at play. Using the Riffle package for R, I then incorporate EcoRegions and Vegetation Types into a non-parametric multivariate analysis to identify specific communities that demonstrate relationships. Finally, I will discuss how these relationships change across different regional, temporal, and ecological landscapes. This research seeks to reproduce the findings of Westerling et al. (2006) at a 700 times higher resolution, and to provide information to further inform fire prediction models used by fire management agencies.

O'Neill, Susan

Susan O'Neill is a Research Air Quality Engineer with the USDA Forest Service, PNW Research Station. Susan started her federal government career in 2002 with Forest Service Research as part of the original team developing the BlueSky Smoke Modeling Framework. She then went on to the Natural Resources Conservation Service (NRCS) working on national policy issues and technology delivery on the NRCS Air Quality and Atmospheric Change Team. She returned to Forest Service Research in 2012 to continue research in smoke modeling. Susan holds a Ph.D. from Washington State University out of the Laboratory for Atmospheric Research.

Wildfire Emissions and Smoke Forecast Modeling - The 2015 Wildfire Season

Oral Presentation

The BlueSky Smoke Modeling Framework links data and models to calculate emissions and smoke concentrations from prescribed fires and wildfires. The system is used to support air quality and land management needs, NOAA National Weather Service smoke forecasting, and wildfire incident support through the emerging federal Wildland Fire Air Quality Response Program, which deploys Air Resource Advisors to Incident Command Teams. The 2015 wildfire season started with widespread fire activity in Alaska, where BlueSky was applied successfully for the first time. Activity then moved to the lower 48 states where BlueSky was applied daily, for example, on the Stouts Creek Fire, Rough Fire, Willow Fire, Wolverine Fire, Collier Butte Fire, Bald Knob Fire, Paradise Fire, and fires throughout the busy northern California/Southern Oregon region. Recent developments include daily forecasts on many high-resolution (1-km, 1.33-km, and 2-km) domains across the country, which has allowed the simulation of smoke flow in drainages and complex terrain. For daily smoke projections, BlueSky gathers fire information from the SmartFire2 system, which merges satellite fire detections from the NOAA Hazard Mapping system, IRWIN federal fire database, and GEOMAC fire perimeters, and uses the NOAA HYSPLIT dispersion model to calculate near-surface PM2.5 concentrations. A synopsis of BlueSky utility supporting various incidents and regions will be given.

Oliva, Patricia

Patricia Oliva is a Postdoctoral Associate at the Department of Geographical Sciences in the University of Maryland. Dr. Oliva's research is focused on the use of multi-spectral remote sensing data for post-fire damage assessment and biomass burning monitoring. She is currently working on the development and validation of active fire detection algorithms for NPP-VIIRS and Landsat-8 data. She also collaborates in a project which aim to integrate active fire detections into a fire behavior model to generate an accurate prediction of fire growth. Her research interest also include burned area and burn severity mapping on a global scale.

Estimation of area burnt using VIIRS 375 m active fire product

Poster Presentation

Smoke generated from wildfires poses a health risk for the population living in the proximity of a fire affected area. Timely and early warning of smoke pollution influence on populated areas is crucial to reduce harmful health impacts. Near real-time estimation of burned area is a key variable for smoke transport and emission models. The enhanced characteristics of the Visible Infrared Imaging Radiometer Suite (VIIRS) 375 m channels make possible the use of near real-time active fire detection data for burned area estimation. In this study consecutive VIIRS 375 m active fire detections were aggregated to produce the VIIRS 375 m burned area (BA) estimation over ten ecologically diverse study areas. The accuracy of the BA estimations was assessed by comparison with Landsat-8 supervised burned area classification. The performance of the VIIRS 375m BA estimates was dependent on the ecosystem characteristics and fire behavior. Higher accuracy was observed in forested areas characterized by large long-duration fires, while grasslands, savannas and agricultural areas showed the highest omission and commission errors. In addition, we performed a near real-time BA estimation of the larger fires occurred in northwestern United States in 2015, which showed good agreement with NIROPs airborne fire perimeters.

Ooi, Mark

Mark Ooi, Dr, University of Wollongong Mark Ooi is a Research Fellow, leading a lab focused on seed ecology and the role it plays in plant population dynamics. Mark's research encompasses several key themes in fire ecology including plant population recovery in response to different aspects of the fire regime inluding season and severity, and the role of fire cues in controlling germination. He has over 30 publications covering the subjects of plant and seed ecology, climate change impacts and conservation biology, and is an Associate Editor of the journal Seed Science Research.

The ecological role of smoke in controlling germination

Oral Presentation

The ability of smoke to promote germination has been known for decades, however viewing the smoke cue too simplistically limits advancing our understanding of the ecological role it can play in fire-prone ecosystems. Knowledge of how plants vary in their response to smoke, or how smoke and other factors interact, remains limited. Over several studies, we identified the type of dormancy most affected by smoke, investigated intra-population variation in smoke response, and the role of diurnal temperatures in controlling depth- and gap-related emergence of a smoke responsive species. Species with physiologically dormant seeds displayed the greatest response to smoke, but only after initial dormancy was overcome via seasonal temperatures. Intra-population variation was large, with seed lots from some individuals producing almost five times the germination response of others, when treated with the same smoke concentration. The underlying temperature cues controlling dormancy and germination of physiologically dormant seeds contribute to ensuring germination only occurs in burnt habitat, rather than in adjacent unburnt, but smoke saturated, areas. A lack of understanding of the ecological relationship between smoke and recruitment dynamics of species in fire-prone systems limits our ability to either predict population persistence or to utilise smoke effectively as a management tool.

Opperman, Tonja

Tonja earned a BS in Forestry from Michigan Tech and a Master's of Forest Science from Yale University. She has worked all over the western US in fuels, helitack, search and rescue, fire management, and fire ecology positions for the Forest Service and the National Park Service, and as a fire research scientist in New Zealand. She teaches fire behavior modeling to Long Term Analysts and provides decision support for ongoing fires nationwide. Tonja works virtually for the interagency Wildland Fire Management RD&A as a Fire Applications Specialist from Gardiner, Montana.

Assessing Resource Benefits at the Incident Level

Oral Presentation

A strategic decision to manage a fire for resource benefits typically needs to take place within a few hours of fire discovery. Decision-makers have a lot of information to assess the probability that values and assets such as infrastructure, power lines, and communication towers will be impacted by fire, but there are fewer tools to assess resource benefits, limiting decision-makers' abilities to assess risk tradeoffs. Well before fire season begins, several methods are available for assessing landscapes with highly valued resources and assets (HVRAs) to understand the appropriate strategic fire response. This is typically a time-consuming, data-intensive process. However, once a particular fire is ignited on a specific landscape under a known weather condition or seasonal severity, assessing potential resource benefits requires a different suite of decision-making tools. The new "benefits" tab in the Wildland Fire Decision Support System provides a place to document an effects analysis to support a decision to use fire for the benefit of the resource. Such an analysis may be rudimentary, but nevertheless can impact decision-making when included as a part of the larger Extended Risk Assessment. Options for conducting a simple effects analysis to address management concerns regarding HVRAs, natural resources, and air quality are presented.

Ortega, Sinuhé

Currently is technical advisor to San Miguel Cajonos, a Zapotec Community of in the Sierra Norte of Oaxaca, Mexico, where work is focused on germination and reproduction of Abies hickelii and other forest species in the community nursery for reforestation in areas affected by Dendroctonus sp. He has also helped develop courses and workshops for understanding forest dynamics in communal lands. With a scholarship awarded by the international graduate scholarship program for indigenous people from the Ford Foundation, he obtained his master's degree in forest science from the Universidad Austral de Chile, in 2012.

A fire frequency reconstruction of a mixed conifer forest in San Miguel Cajonos, Oaxaca, México

Oral Presentation

We present results of a study to determine the fire frequency in a temperate coniferous forest dominated by Pinus hartwegii in the upper basin of San Miguel Cajonos, Oaxaca, Mexico. We analyzed increment cores of climate-sensitive trees as well as cross-sections of dead and live fire-scarred trees. The oldest fire in the reconstructed history occurred in 1841 and the most recent in 2007. The most extended and severe fire for the last 150 years took place in 1964. The Average Fire Interval had a minimum period of 4.7 years and a maximum of 13 years. Most fires occurred in the spring season, dominated by dry conditions. In the last 50 years, the natural fire frequency has decreased as influenced by land-use changes, logging, and fire suppression activities.

Ottmar, Roger

ROGER D. OTTMAR Roger Ottmar is a Research Forester with the Fire and Environmental Research Applications Team, Pacific Northwest Research Station at the Pacific Wildland Fire Sciences Laboratory located in Seattle, Washington. He has been involved with fuels, fire, and smoke related research for over 35 years. He leads the Prescribed Fire Combustion and Atmospheric Dynamics Research Experiment (RxCADRE) and the Fire and Smoke Model Evaluation Experiment (FASMEE) to provide novel and critical observational data necessary to evaluate and advance fire and smoke modeling systems.

Fire and Smoke Model Evaluation Experiment (FASMEE)

Poster Presentation

The primary objective of the Fire and Smoke Model Evaluation Experiment (FASMEE) is to provide novel and critical observational data necessary to evaluate and advance fire and smoke modeling systems and their underlying scientific models. The FASMEE field campaign will be conducted on prescribed burns in the southeastern and western United States. The FASMEE planning phase will occur between March 2016 and June 2017 and will provide a comprehensive study plan that will include sampling methodology, safety, logistics, and data management. The FASMEE field campaign will be initiated in the fall of 2018 and extend through 2020. It will be conducted on 4 to 8 large (>500 acres) operational prescribed burns targeting heavy fuel loads and high intensity burn events. Multiple agencies will be recruited to participate in the research project and assist in funding. Discipline leads and observational teams will be identified through two open solicitation processes (fall, 2015 and 2016) to complete the study plan development, observational data collection, reduction and analysis, data management, and initial model evaluation.

Owen, Suzanne

Suzanne Owen is a Chemist Intern with the USDA Forest Service, Rocky Mountain Research Station in Flagstaff, AZ, USA, where she analyzes the physical and chemical properties of plants and soil. She is also working towards her PhD in Forestry at Northern Arizona University, researching tree regeneration and soil microbial communities following large stand-replacing wildfires. Her most cited work contrasted the ecological effects of mastication and pile burning in pinyon-juniper woodlands: Owen et al. (2009) Above- and belowground responses to tree thinning depend on the treatment of tree debris. Forest Ecology and Management. 259: 71–80.

Mechanical Mastication and Exotic Plant Invasion: A Synthesis of Research and Observations

Oral Presentation

Mechanical mastication is a fuel treatment that shreds trees and shrubs and distributes resulting woody debris across the topsoil. Unfortunately, sometimes this practice provides ideal habitat for some exotic plant species that are highly invasive. Once established, some of these species potentially threaten native biodiversity and ecosystem processes. We surveyed on-the-ground practitioners who either implement or monitor mastication treatments and reviewed published literature. We found that cheatgrass (Bromus tectorum), Canada thistle (Cirsium canadensis), and bull thistle (C. vulgare) were the most common exotic species associated with mastication treatments. We also identified characteristics of mastication treatments associated with the invasion and spread of exotic plant species: 1) Presence of existing populations of invasive exotic plants on-site or nearby before treatment; 2) Low cover of native herbaceous plant cover and high levels of bare ground; 3) Additional disturbances after mastication, including burning woody debris or incorporating it into the soil, and repeated mastication treatments. Soil compaction and increased soil moisture and nitrogen after mastication treatments can also favor exotic species. Greater emphasis on mitigating exotic plant species invasion when planning and implementing mastication fuel treatments is critical for avoiding trading overly dense crown fuels for persistent populations of invasive, exotic species.

Are Ponderosa Pine Forests Regenerating After Severe Wildfires?

Student Poster Presentation

In recent years, wildfires in southwestern ponderosa pine forests have resulted in larger patches of tree mortality than previously recorded. The sustainability of these forests depends on post-wildfire seedling regeneration. Our objectives are to determine: 1) spatial patterns of post-fire seedlings, and 2) if fire severity influences regeneration niches and seedling growth in two large Arizona wildfires that occurred in 2000 and 2002. We measured the spatial location of all seedlings within replicated 4-ha plots in different burn severities; for a subset we measured seedling growth rates and environmental variables to characterize regeneration niches, including soil chemical and biological properties. We found ponderosa pine seedlings significantly aggregated near forest edges, randomly dispersed > 200 m from edges, and surprisingly some were over 400 m from any live trees. Preliminary results show greater seedling growth rates in burned areas than in unburned forest, and similar soil chemistry and ectomycorrhizal fungal inoculum and community composition across fire severities and unburned areas 10+ years post-wildfire. These results are encouraging since pine seedlings are re-establishing in severely burned areas; however they are not the dominant regenerating plant species and it is not clear whether densities are sufficient to once again become the dominant species.

Panunto, Matthew

Matthew H. Panunto is an Ecologist with the USDA Forest Service's Fire Modeling Institute in Missoula, MT. Prior to joining FMI in 2015, Matthew worked at the US EPA's Office of Research and Development in Athens, GA where he assisted in the development of geospatial and hydrologic program applications for the Better Assessment Science Integrating Point and Nonpoint Sources (BASINS) environmental analysis system. He has a B.S. in Environmental Studies from Wesley College (Dover, DE), and an M.S. in Geography and Environmental Systems from the University of Maryland Baltimore County (Baltimore, MD).

Mapping the Potential for High Severity Wildfire in the Eastern United States

Poster Presentation

The Fire Severity Mapping System project (FIRESEV) currently provides a comprehensive map of the western U.S., offering a static geospatial reference that describes the potential for high burn severity under 90th percentile weather conditions should ignition occur. This mapping project is presently being expanded to include the east in an effort to incorporate severity predictions for the entire contiguous U.S. into the Wildland Fire Decision Support System (WFDSS). This expansion presents a unique series of challenges to the methods originally applied to the west, primarily with regard to the availability of spatial wildland fire data. The severity predictions generated in this analysis are dependent on the number and spatial variability of satellite-derived burn severity assessments for the east, which are often excluded from the nationwide Monitoring Trends in Burn Severity database (MTBS) due to their relatively smaller burn areas. As such, many eastern wildfires require a manual delineation of burn area and calculation of burn severity, presenting challenges for processing available satellite imagery to best capture eastern vegetation growth patterns (i.e. initial vs extended assessment). The finished products representing the potential for high severity fire for the eastern U.S. are expected to be made available in the spring of 2016.

Parisien, Marc

Marc Parisien is a research scientist with the Canadian Forest Service based out of Edmonton, Alberta. He is interested in spatio-temporal modeling of fire regimes.

Age dependence of wildfires in the northern boreal forest of Canada

Oral Presentation

Long considered to have a fire regime that is independent of stand age, recent studies have shown that young northern boreal forest stands (<30 years) are substantially less likely to burn than old ones. Although the likely cause for this age dependence is the slow biomass accumulation that limits the probability of fire ignition and growth, there is little empirical evidence to substantiate these claims. We aimed to measure burnable biomass in different time-since-fire stands across a landscape of the boreal plain of western Canada. Results show a clear dichotomy in fire–fuels dynamics between uplands (forests) and lowlands (wetlands). In uplands, where the age dependence of wildfire is high, postfire flammability decreases due to reduced biomass, but also a change in dominant vegetation. In lowlands, wildfire occurrence is largely dictated by weather extremes: wetlands generally burn under severe drought conditions. In these areas the age dependence of wildfire is comparatively low; wetlands can re-burn shortly after a fire because their biomass reservoir is rapidly replenished (<5 years). In addition to the large predicted changes in fire weather at high latitudes, changes in the proportion of upland and lowland vegetation types may drastically alter fire-vegetation dynamics of this biome.

Park, Jane

Jane Park is the fire and vegetation specialist in Banff National Park, Alberta Canada. Jane has been involved with active fire restoration with Parks Canada for the past 13 years. She obtained her M.Sc. from the University of Calgary in Forest Ecology. Her interests include prescribed fire for ecosystem management in protected areas, ecological effects of fire on various ecosystem components. Parks Canada's prescribed fire program has been a leader in the implementation of prescribed fire in Canada for the past 30 years.

Use of multiple iterations of prescribed fire to restore historic vegetation patterns in Banff National Park, Alberta, Canada

Oral Presentation

Fire cycles in the montane forests of Banff National Park generally range from 50-100 years. Research has shown that the likely source of historic wildfires was anthropogenic, intentionally lit by first nations to draw prey species such as ungulates and bison into valley bottoms where hunting would be easier. As the result of a legacy of fire suppression, open vegetation types such as aspen (Populus tremuloides) and Douglas-fir (Pseudotsuga menziesii) grasslands have been replaced with closed, homogenous stands of lodgepole pine (Pinus contorta). These closed forests represent relatively low quality habitat for a variety of important wildlife species and can significantly impact shade intolerant keystone species such as Whitebark pine (Pinus albicaulus). Following a shift in agency policy in the 1980's, a prescribed fire program was developed to shift back to a high frequency, mixed severity fire regime. Since then, many landscape level (1000 to 5000 ha) prescribed fires have been implemented in various areas of the park, often in very complex physical and political landscapes. This presentation will focus on two areas (the Red Deer Valley and the Sawback range) where multiple iterations of prescribed fire have converted closed mature lodgepole pine forests to open Douglas-fir and aspen grasslands.

Parks, Sean

Sean Parks is a Research Ecologist with the Aldo Leopold Wilderness Research Institute (an entity of the Rocky Mountain Research Station). He is actively investigating the relationship between wildland fire and topography, past fire, weather, and vegetation within wilderness and other protected areas. Sean is also quantifying how fire regime characteristics are shaped by climate, which will potentially provide better information on how fire regimes will shift under future climate conditions.

Wildland fire deficit and surplus in the western US

Oral Presentation

Human activities have disrupted the natural role of fire in many regions of the globe. These activities can either exclude or promote fire, resulting in a 'fire deficit' or 'fire surplus', respectively. In this study, we developed a model of expected area burned as a function of climate. We developed our model for the western US using reference areas (e.g., wilderness) with low human influence; the relationship between climate and fire is strong in these areas. We then quantified the degree of fire deficit or surplus for all areas of the western US as the difference between expected (as predicted with the model) and observed area burned from 1984-2012. Results indicate that many forested areas in the western US experienced a fire deficit from 1984-2012, likely due to fire exclusion by human activities. We also found that large expanses of non-forested ecoregions experienced a fire surplus, presumably due to introduced annual grasses and the prevalence of anthropogenic ignitions. The heterogeneity in patterns of fire deficit and surplus among ecoregions emphasizes fundamentally different ecosystem sensitivities to human influences and suggests that large-scale adaptation and mitigation strategies will be necessary in order to restore and maintain resilient, healthy, and naturally functioning ecosystems.

Resistance to reburn: factors contributing to reduced probability of burning in recently burned areas

Oral Presentation

Increased fire activity over the last few decades, coupled with the availability of satellite-inferred burn severity data, has spiked interest in the effects of repeat fires, or reburns. However, recent evidence suggests that sites that have recently burned have a lower probability of burning compared to unburned sites. In this presentation, we will highlight two ways in which sites that have recently burned resist burning again. In four large wilderness study areas in the western US, we will show that wildland fire 1) acts as a barrier to subsequent fire spread and 2) reduces the probability of subsequent fire ignition. Both of these factors result in an increased resistance to burning (compared to unburned sites). These regulatory feedbacks are fairly strong immediately after fire but weaken as fire-free intervals increase and fuels reaccumulate. The strength and longevity of these feedbacks also vary among study areas and weaken under extreme weather conditions. Repeat fires certainly occur, as shown by many of the presentations in this session, but a resistance to reburn is also evident. This presentation, and others in this session, collectively highlight the complex responses and profound impact of wildland fire on successional dynamics and subsequent fire effects.

Barriers to wildland fire spread: the role of past fires, weather, topography, and fuel

Poster Presentation

Fire activity in the western US has increased dramatically in recent decades, and consequently, there is heightened interest in quantifying the ability of wildland fire to act as a barrier to the spread of future fire. However, topographic features (e.g., ridge tops and valley bottoms), weather, and fuel conditions may also influence the spread of wildland fire. A few studies have explicitly documented the role of past wildland fire in limiting subsequent fire spread, but none have examined this effect in combination with other factors such as topography, weather and fuel. We investigated how these four factors influenced the progression of subsequent fire in four large wilderness areas: three in the Northern Rockies and one in the Southwest . Results indicate that weather asserts the strongest influence in impeding fire spread in the Northern Rockies while topography has the greatest effect in the Southwest. Past wildland fire also limits subsequent fire spread in all study areas, but this decays through time as fuels reaccumulate. More broadly, our study demonstrates how biotic and abiotic factors regulate fire on landscapes and that the relative influence of each element in impeding fire spread varies according to ecosystem type and their associated fire regime.

Parsons, Russell

Russ is a Research Ecologist with USFS Fire Sciences Lab in Missoula, MT. Russ received his B.S. in Forestry from U.C. Berkeley, in 1992, his M.S. in Forest Resources from U. Idaho in 1999, and his Ph.D. in Forestry from U. Montana in 2007. His research includes landscape fire simulation modeling, 3D fuel and fire modeling, and the impact of insect attacks on wildland fuels and fire. A key theme of current work is to improve our understanding of how fuel treatments alter fire behavior and the consequences of these changes for firefighter and community safety in fire management.

Exploratory analysis of interactions of patchy/clumpy fuel configurations on fire behavior with a physics-based fire model

Oral Presentation

Fuels management strategies increasingly suggest that incorporation of spatial heterogeneity in fuel treatments can lead to more resilient, diverse and healthy forest ecosystems. However, current operational fire models are limited in their capability to represent fuel heterogeneity, particularly at fine scales, or to adequately capture how such heterogeneity may affect fire behavior over a range of wind conditions. Consequently, managers face uncertainty regarding how well patchy/clumpy fuel configurations will affect fire behavior. In this study, we used the physics-based fire behavior model, FIRETEC, to explore interactions between different levels of canopy fuel aggregation, canopy cover, and wind speed. As little is yet known regarding how these factors interact, we chose an exploratory approach, spanning each factor broadly. We found that patchy/clumpy fuel configurations significantly altered fire behavior, but these effects varied greatly with different wind speeds and with canopy cover. Higher canopy cover reduced windspeed profiles due to drag effects, but had higher rates of spread, intensity, and lateral spread rates. While larger clumps produced the highest variability in fire behavior,this variability decreased with increasing windspeed. Clump effects were most pronounced at moderate wind speeds. Our results suggest patchy/clumpy fuel patterns produce complex interactions between the fire, fuel and atmosphere.

Stand-scale fuel treatment analysis with STANDFIRE: fuel and fire modeling for current and future needs

Oral Presentation

Across the country, hundreds of millions of dollars have been spent, and tens of millions of acres of fuels have been treated to proactively mitigate threats to firefighters and communities, or to maintain or restore healthy ecosystems. Yet, while some case studies have shown positive results, there uncertainty remains regarding how effective such treatments may be in modifying fire behavior. Although wildland fuels are highly heterogeneous, current systems use fairly simple fire modeling approaches that are poorly equipped to address either the natural heterogeneity found in wildland fuel environments or fuel changes that arise as a result of fuel treatments. Here, we describe a spatially explicit, prototype research platform for fuel and fire modeling, called STANDFIRE, which extends the capabilities of FFE-FVS using dynamic 3D fire models to calculate both fire behavior and effects. A highly detailed representation of fuels facilitates examination of fuel changes such as beetle attacks as well as analyses of the effectiveness of fuel treatments in altering fire behavior. Forest growth is modeled by FVS, but fuel treatments can be carried out either in FVS or within STANDFIRE itself. A modular design permits the incorporation of new science knowledge as it becomes available.

Patton, Jeannie

Jeannie Patton, LANDFIRE Communications Lead, joined The Nature Conservancy in 2004. She earned her M.A. in Literature at the University of Northern Colorado and, prior to LANDFIRE, was a journalist; magazine, web, and newspaper feature writer; public relations specialist; copy editor; and college journalism, research and literature teacher. She is an award-winning author of 150+ published articles ranging from skiing and outdoor sports to western ecology and social commentary. She manages LANDFIRE's internal and external websites, leads communications and outreach projects, writes occasional blogs, and provides enthusiastic editing and administrative support to the LANDFIRE team. Jeannie lives in Boulder, CO.

Two options, depending on focus of the "Fire Ecology" stream 1 - Communicating at the National Scale: The LANDFIRE Experience 2 - Supporting Fire Ecology through Effective Communications: LANDFIRE Lessons Learned

Oral Presentation

National programs such as LANDFIRE are often thought of as purely technical endeavors, but they are as much about communicating with people as they are about imagery, algorithms and tools. In its first ten years, the LANDFIRE program broke new ground by supporting an in-house communications plan that sometimes hiccupped, but more often succeeded in reaching a diverse audience of federal and non-federal constituents, as well as others involved in land management activities. With the launch of LANDFIRE's three-year project to review and update more than 1500 Biophysical Settings (BpS) models and descriptions, it is appropriate that we examine and evaluate our communication activities of the last decade. In this presentation, we will provide some lessons learned based on our experience as a national program with a geographically diverse user base that exhibits a huge variety of needs and interests. We will describe how we have modified our communications strategy and tactics based upon what we have learned.

Pérez-Salicrup, Diego

Diego R. Pérez Salicrup received his undergraduate degree from Universidad Nacional Autónoma de México, and then his MS and Ph.D. from University of Missouri St. Louis. He then completed a postdoctoral fellowship at Harvard Forest, and then moved back to Mexico to work in his alma mater, but at the then newly built Morelia campus. He has worked in seasonally dry and wet tropical forests, and in the past years in fire regimes in coniferous forests.

Historical Fire Regimes and Fire Managament in an Emblematic Biosphere Reserve in México

Oral Presentation

The Monarch Butterfly Biosphere Reserve, located in the Mexian Transvolcanic Belt, is one of the most emblematic biosphere reserves in North America. We characterized historic fire regimes using dendrochronological techniques, interviews with local inhabitants, and evaluation of fire information from the Biosphere Reserve authorities. We found that fire regimes are largely disturbed, and current uses of the forest hinder investigating what natural fire regimes might have been in this region. Local authorities directly or indirectly facilitate a fire suppression policy. Local inhabitants reduce fuels loads by different indirect usages of the forest. Although fire ignitions are clearly associated with human activity, agricultural fires are not the major cause behind forest fires. An Integral Fire Management Plan is needed in this reserve, to ensure that policy and practices by local inhabitants are consistent with the long term maintenance of forest cover. This plan must incorporate the experience of local inhabitants.

Peterson, David

David W. Peterson is a Research Forester with the USDA Forest Service, Pacific Northwest Research Station, in Wenatchee, Washington. Dave's research focuses primarily on restoration and management of dry coniferous forests of the interior Pacific Northwest, with emphases on forest ecosystem responses to wildfires and the effects of post-fire forest management practices, including emergency slope stabilization treatments and post-fire logging. He also maintains ongoing research interests in dry forest restoration treatment effects, forest vegetation responses to climatic variability and change, and oak savanna ecology.

Persistence of emergency post-fire seeding and fertilization treatment effects: short-term efficacy and longer-term impacts

Oral Presentation

Emergency post-fire slope stabilization treatments are applied following high severity wildfire to reduce hazards from flooding and erosion, but questions remain about the efficacy and longer-term ecosystem impacts of these treatments. We applied experimental seeding and fertilization treatments to 20 severely burned sites from four wildfires to assess initial treatment efficacy (first two years after wildfire) and longer-term treatment persistence (8-12 years after fire). First year seeded species cover was generally low (<2%) despite considerably variability in site conditions and post-fire weather. Fertilization treatment effects varied considerably among sites, but fertilization increased plant cover by up to 9% in the first year and by up to 15% in the second year on individual sites (average increases were 2% and 4%). Seeded species persisted on many sites up to 8-10 years after treatment – particularly on warmer and drier sites – with seeded species cover increasing by up to 30% at one site. These results suggest that seeding and fertilization treatments provide only small increases in aboveground plant cover when post-fire hazards are the highest (1-2 years post-fire), but seeded species can persist for a decade or longer on some sites.

Peterson, Birgit

Birgit Peterson, Research Scientist, ASRC Federal InuTeq, contractor to USGS EROS. Research has focused on integrating lidar into canopy structure and fuels mapping. Has been part of LANDFIRE team since 2005.

Deriving CBD from lidar for operational canopy fuels mapping

Oral Presentation

Canopy bulk density (CBD) is an important metric for describing canopy fuels, and is defined as the mass of available canopy fuel per unit canopy volume. Various methods have been adopted to estimate CBD but improved characterization, addressing both quantity and spatial distribution, of this parameter is desired for informing fire behavior models. CBD is often estimated using forest inventory data collected in conventional field plots. This process, however, is relatively inefficient in terms of cost and areas covered. In contrast, developing methods for estimating CBD that rely on remotely sensed data can lead to broader scale estimations at relatively low costs. Lidar data are especially valuable for estimating CBD because they capture the three-dimensional distribution of canopy material. Previous studies have developed methods for deriving CBD from lidar in specific areas, using algorithms highly tuned to the local study area. This paper summarizes efforts to develop more general methods for deriving CBD from differing sources of lidar data. In particular, efforts are geared towards providing reliable CBD estimates for inclusion in the Creating Hybrid Structure from LANDFIRE/lidar Combinations application and informing the LANDFIRE CBD product.

Peterson, David

Dave W. Peterson is a Research Forester with the USDA Forest Service, Pacific Northwest Research Station, in Wenatchee, Washington. Dave's research focuses primarily on restoration and management of dry coniferous forests of the interior Pacific Northwest, with emphases on forest ecosystem responses to wildfires and the effects of post-fire forest management practices, including emergency slope stabilization treatments and post-fire logging. He also maintains ongoing research interests in dry forest restoration treatment effects, forest vegetation responses to climatic variability and change, and oak savanna ecology.

Minimal impacts of post-fire logging on understory plant cover and diversity 18 years after wildfire in dry coniferous forest

Poster Presentation

Assessing the resilience of natural ecosystems to disturbances often requires long-term studies. Post-fire logging often generates debate, in part owing to short-term studies that have documented reductions in understory plant cover and diversity or tree regeneration density in logged stands compared to stands not logged after fire. In this study, we examined understory vegetation cover and diversity within a post-fire logging experiment 18 years after wildfire and treatment. Treatments included commercial logging, commercial logging followed by removal of smaller trees (fuel reduction), and an untreated control. Plot-level plant species richness (40 m2), beta diversity among plots, the Shannon diversity index, exotic plant cover, and exotic plant species richness were not significantly different among treatments 18 years after wildfire and treatment. Total plant cover was slightly lower in the fuel reduction treatment than in the unlogged control or commercial treatment, which were not significantly different. Plant community analyses and evaluation of individual species similarly revealed few differences among the three treatments. These results suggest that the short-interval disturbance caused by post-fire logging may have few effects on longer-term vegetation recovery in forests historically adapted to frequent low severity wildfire.

Peterson, Birgit

Birgit Peterson, Research Scientist, ASRC Federal InuTeq, contractor to USGS EROS. Research focus on integrating lidar into canopy structure and fuels mapping. Has been part of LANDFIRE team since 2005.

Integration of GLAS and Landsat data for canopy structure mapping in Alaska

Poster Presentation

LANDFIRE provides a set of geospatial data layers for informing fire behavior and other applications for all lands within the United States. For current and past mapping and updating efforts, LANDFIRE has relied heavily on field observations and Landsat data for developing a number of products. This has presented challenges in areas where field data are sparse. Such is the case in Alaska, where significant portions of the state are inaccessible. Field data collection is expensive and time-consuming, therefore data holdings are typically localized and sparse. This led to modifications in the LANDIFRE forest canopy height and cover legends for Alaska as compared to those of the conterminous United States, reducing the thematic resolution. In subsequent updates to the LANDFIRE products, improving these mapping legends for Alaska was a priority. Spaceborne lidar data from the Geoscience Laser Altimeter System (GLAS) were used to inform the mapping process in lieu of field observations. GLAS provided hundreds of thousands of observations in Alaska between 2003 and 2009, which were vetted for quality and then used to inform the mapping process. The updated forest canopy height and cover products were released as part of the updated LANDFIRE 2010 and 2012 product suites, respectively.

Phiri, Darius

Darius Phiri is a Lecturer and research at Copperbelt University in Zambia. His research focus on Forest Management, fires and natural resource governance in Zambia. He has published a number of papers on forest biomass, forest inventory and renewable energy in Zambia and South Africa.

History of Fire in Kafue National Park of Zambia: From 2000 to 2013

Oral Presentation

Forest fires have long been considered as a permanent characteristic of most ecosystems in protected areas of the sub-Sahara Africa. Positive and adverse effects of wildfire in protected areas such as the Kafue National Park (KNP) are important to the ecology, structure and composition of the vast ecosystem. However, the historical extent and impacts of most of the fires still remain unclear. This makes it pertinent to understand the history of fire in KNP in Zambia as it has influence on the wildlife ecology. This study also examined the relationship between the area burnt and the animal population for particular years. Geo spatial analysis was used to understand the extent and the intensity of fire in different vegetative types using Moderate Resolution Satellite Imagery (MODIS). The study showed that during the period between 2001 to 2013 about 57 ± 3% of KNP was burnt yearly. The highest burnt area occurred between 2002 to 2005 when over 70% of the area in KNP was burnt while the period between 2007 to 2011 had the least area burnt (30%). The most prone vegetation to fire was the wooded grasslands (70% burnt area), Acacia woodland (80% burnt area) and grasslands (70% burnt area) of the nine Game Management Areas (GMAs) surrounding KNP, Nkala (38% burnt area) and Sichifulo (40% burnt area) were the most burnt GMAs, while Lungu-Luswishi (10% burnt area) was the least burnt GMA. Over 40% of the areas experienced early burning while 25% of these areas experienced late burning. The results also showed that the animal population increased with an increase in the extent of the burnt area. The major factors affecting the burning pattern are illegal anthropogenic activities and rainfall pattern.

Picotte, Joshua

Joshua J Picotte is a fire specialist with ASRC Federal InuTeq, which is a contractor to the U.S. Geological Survey (USGS) Earth Resources Observation and Science (EROS) Center. He has worked on the Monitoring Trends in Burn Severity (MTBS) and LANDFIRE projects for the past five years.

Sisyphus and MTBS: Utilizing Multi-Sensor Active Fire Detections to Help MTBS Map Fires in the U.S.

Oral Presentation

Monitoring Trends in Burn Severity (MTBS) has mapped 19,000+ fires within the U.S., and Puerto Rico. This postfire mapping effort focuses on mapping the large fires that are reported within the U.S., but during that effort many unreported fires are discovered and the number of state-reported prescribed fires has overwhelmed shrinking resources. The more we map, the more we find. In 2012, the National Aeronautics and Space Administration (NASA) funded this effort to automate many of the processes used by MTBS and detect unreported fires. Procedures were developed and tested at three sites within Florida, U.S., utilizing real-time fire detections (e.g. MODIS), identifying fire signatures within Landsat scenes, and automating Landsat scene ordering and preprocessing. The project received additional funding from NASA in 2014 to refine these automated procedures and hopefully expand the project throughout the conterminous U.S. (CONUS). This presentation will explain the project's current accomplishments, what procedures have been updated since 2014, what needs to be completed, and a timeline for the process development.

Plata, Justin

Justin Plata is a senior undergraduate wildlife student at Texas A&M University-Kingsville. Justin is the Past President of the TAMUK Wildlife Society, an organization that just won its 5th national Chapter of the Year title from The Wildlife Society. Justin plans to graduate with his BS degree in May 2016 and begin a MS degree in wildlife sciences with the Caesar Kleberg Wildlife Research Institute at Texas A&M University-Kingsville.

Do small mammals cause spot fires during prescribed burns? Fact or Urban Legend?

Student Poster Presentation

A commonly-held belief among land manager is that rabbits or rodents may become trapped during a prescribed burn, and in an attempt to escape, run through the fire to adjacent property, thus igniting the adjacent property. Our objective is to determine if such a scenario is plausible. We developed 10 pairs of 3 x 3 m plots with each pair of plots separated by 2.5 m of tilled soil. Each plot contained >125 g/m2 herbaceous biomass, which was sprayed with Round-up® once per week for a month to achieve 100% kill. Skins from cottontail rabbits (Sylvilagus virginianus) and cotton rats (Sigmodon hispidus) were obtained and used to simulate live animals. Skins will be wrapped around a moistened sponge to represent approximate body moisture content of a live animal and will be placed in the center of a paired plot. The plot will be ignited with a drip torch and the simulated animal will be pulled through the fire, placed in the center of the adjacent plot pair, and allowed to smolder. We will report the likelihood of spot fires being created by small mammals running through a prescribed burn.

Poling, Megan

Megan E. Poling is a masters student as part of Northern Arizona University's School of Forestry program and she will continue on to obtain her doctorate there as well. She has been a wildland firefighter with the USFS for 5 years and hopes to integrate her field experience with her academic background to advance fire management.

Quantifying trends in burn severity in Arizona and New Mexico forested ecosystems from 1984-2013

Oral Presentation

Wildfires have increased in frequency, size, and are burning longer in western Northern America since the 1980s. Recent research also suggests that area burned severely and proportion of severe fire is also increasing. Our study assesses trends in fire size, extent and proportion of high severity fire within Arizona and New Mexico forested ecosystems from 1984-2013. We also examine trends in high severity patch size, extent, and relationship to fire size. Furthermore, we assess these trends in dominant biotic communities based on Wahlberg et al. 2014 Southwestern Ecological Restoration Unit (ERU) data. The analysis uses multi-spectral Landsat remote sensing data for all fires >400 ha in the Monitoring Trends in Burn Severity (MTBS) program. A regional high severity threshold value of 645 is used based on a non-linear regression model of relative differenced normalized burn ratio (RdNBR) versus composite burn index (CBI) field plot data. We will present all results from the trend analysis and discuss information critical to managing pre- and post-fire landscapes.

Portier, Jeanne

Jeanne Portier is a PhD student at Université du Québec à Montréal (UQAM) and works within the Center for Forest Research team. She is interested in fire regimes in boreal forests of Quebec, Canada, and more precisely on the northern portion of that territory. Using statistical models, she examines how the fire regime is varying spatially, how it is linked to climate and how it can influence the forest's resilience. She is also interested in modelling stands' biomass based on empirical datasets to examine whether it can be linked to the fire regime.

Do fire regimes differ south and north of the limit of commercial forest of Quebec, Canada?

Oral Presentation

Fire is the main disturbance in boreal forests. In northern Quebec (Canada), where forest management is not allowed, stands' vulnerability to fire is particularly high as they already face harsh climatic conditions, which sometimes jeopardize their regeneration potential. Although fire regime spatial variations are well documented, few investigators are interested in going north of Quebec's limit of commercial forest to analyze if and how fire regimes differ from the south. We used time since fire (TSF) data from a broad field campaign in Quebec's boreal forests along four North-South-oriented transects to do a 300-year fire history reconstruction. Along each transect, a moving average of TSF allowed us to define a point – proven to be consistent with the limit of commercial forest – beyond which the mean TSF is shorter. Survival analyses were used to compute the hazard of burning in each resulting transect portion and to relate it to climate. The hazard of burning is higher north of the limit, lower in the Southeast, and is positively linked to the severity rating – climate index based on temperatures and precipitations. Protecting the northern boreal forests from management is therefore essential, especially as future climatic conditions could intensify fire regimes.

Preisler, Haiganoush

Haiganoush K. Preisler is a statistical scientist at the Pacific Southwest Research Station, USDA Forest Service in Albany California. Here work in the past 20 years have focused on the development of probabilistic risk models and data analytic techniques necessary for assessing and predicting impacts of disturbances on forest ecosystems.

Probabilistic Assessment of the Seven-Day Fire Potential Outlook for the Western USA

Oral Presentation

Starting in 2006, the Predictive Services in the USA - a program of the National Wildfire Coordinating Group – has been producing 7-Day Significant Fire Potential Outlooks for each Predictive Services Area during the core fire season. The forecasted Fire Potential Outlooks are produced to support fire managers in their efforts to allocate and preposition fire suppression resources in advance of a significant fire event. While the Fire Potential Outlooks give qualitative description of fuel and weather conditions, they do not forecast quantitative measures, such as the expected number of significant events or a forecasted probability of a large fire. In this study we attempt to use the qualitative fire potential outlooks produced by the Predictive Services, together with gridded 7-day forecasts of the Energy Release Component (one of the National Fire Danger Rating indices in the USA), to produce quantitative fire danger outlooks. The statistical models produced are based on six years of fire occurrence data (2007 - 2012) and can be implemented in the future to produce real time probabilities of significant fire events and distributions for expected numbers of large fires with measures of uncertainties.

Prichard, Susan

Susan Prichard Research Scientist University of Washington School of Environmental and Forest Sciences One of Susan's main research topics is the effect of fuel treatments and past wildfires on subsequent patterns and burn severity following large wildfires

Past burn mosaics in the North Cascades Mountains and implications for fire management

Oral Presentation

We present an overview of current fire management strategies in the North Cascades region of Washington State to encourage landscape resilience to fire under a rapidly changing climate. In many fire-prone ecosystems of the inland Pacific Northwest, fire exclusion has led to increased continuity of surface and canopy fuels at small spatial scales and increased connectivity of vegetation patches at the scale of landscapes. With the exception of park and wilderness areas, most wildfire starts are actively suppressed and the majority of land area burned by wildfires is during more extreme fire weather events. Several recent studies have examined burn mosaics and fire-on-fire interactions across dry forest and montane landscapes in the region. In some cases, past burn mosaics constrained subsequent fire spread and patterns of burn severity. However, these effects are highly dependent on rates of live and dead surface fuel accumulation following past fires and on weather patterns during subsequent fire events. Improved understanding of when and where wildfires might mitigate subsequent wildfire behavior and effects is critical to help inform management of future wildfires.

Wildland fire-on-fire interactions: a review of fire-prone ecosystems and implications under a changing climate

Oral Presentation

The incidence and extent of wildfires has increased dramatically in many fire-prone ecosystems. As more wildland area burns, an increasing proportion of landscapes will be reburned by subsequent wildfires. An understanding of how burn mosaics influence fire spread, burn severity, and successional trajectories is important for managing wildland fires and promoting more resilient landscapes, particularly under a warming climate. We provide a review of published studies on past fire interactions in fire-prone ecosystems including (1) semi-arid forests and rangelands of North America, (2) tropical and subtropical forests, grasslands and savannas, (3) Mediterranean ecosystems, and (4) boreal forests. Our review of fire-on-fire interactions highlights the complex roles fire plays in modifying patterns of vegetation, available fuels and subsequent wildfires. In fire prone ecosystems, historic fire regimes generally favored mosaics of grasslands, shrublands and savanna vegetation over closed-canopied forests. Over the past century, fire regimes have shifted in many woodlands, savannas and dry forests from frequent fires to infrequent fires with concomitant changes in accumulated fuels and vegetation. Restoring frequent fire to long unburned landscapes is challenging and costly. However, in fire-prone ecosystems, fire will return, and legacies of past fires, or lack thereof, often dictate the characteristics of subsequent fires.

Prusak, Zachary

Zachary A. Prusak, Florida Fire Manager/Central Florida Conservation Director/The Nature Conservancy Zach has worked for the Nature Conservancy since January 2005, supporting the Conservancy's Florida Fire Team, located across the state on several Preserves. Zach also works with state, federal, local and private conservation groups in order to promote fire training opportunities and facilitate on-the-ground partnerships, while also serving as the Florida Conservancy liaison on national fire issues. Zach has over 27 years' experience working with prescribed fire, and is qualified as a Prescribed Fire Burn Boss Type 2 (RxB2). Zach holds both an M.S. and B.S. in Biology from the University of Central Florida.

"The Fire Team Model: Getting More Acres Burned Collaboratively"

Oral Presentation

There are many challenges to the goal of increasing the amount of controlled burning that is attempted during any given year. One of the largest challenges identified in multiple surveys of private land owners as well as Federal and state agencies is the lack of enough qualified crew. Since 1999, The Nature Conservancy's Florida Chapter has been building upon the "Fire Team" model started by the Florida Park Service, which is structured to provide fire-ready, qualified crew and equipment to land owners and burn bosses within a quick timeframe. This model has proven to be very successful, leading to an increase in the number of fires conducted on any given optimal burn day, benefitting both the fire-dependent ecosystems and reducing fuel loads. Largely grant-funded and similar in concept to the mid-western "Prescribed Burn Associations," this model can be exported to other regions. This presentation will explore the operational structure and cost of these Teams, while making the case that an increase in Federal or local funding for additional Teams distributed in a geographically strategic manner would benefit the pyrogenic landscapes while lowering the intensity of future wildfires.

Pyne, Stephen

Steve Pyne, professor in the School of Life Sciences, Arizona State University, is completing a multi-year survey of America's fire scene since 1960. The narrative conclusion of that project, Between Two Fires: A Fire History of Contemporary America, will be published in October, 2015. A suite of shorter, complementary, regionally based reconnaissances will be published beginning in spring 2016. The proposed talk will summarize the results of this enterprise.

Fire's American Century

Oral Presentation

For 50 years after the Great Fires of 1910, the U.S. tried to remove fire from its wildlands. The U.S. Forest Service provided an institutional matrix, eventually becoming a benign hegemon. By 1960 that historic task seemed to be largely completed. Then a revolution began that sought to put good fire back and to create a more pluralistic governance structure. This project has now run its 50-year course, and its achievements and breakdowns are apparent. The country now seems poised for another phase change in management and organization. The presentation will track the narrative arc of what now constitutes wildland fire's American century.

Fire history as big history

Oral Presentation

The history of fire on Earth offers a continuous narrative across 420 million years. Fire is primordial: it's older than grass, trees, and insects. And fire is new: combustion is likely to be the informing theme for the future that is the Anthropocene. Fire history is big history. The broad chronology is simple. Fire is a creation of the living world; its chemistry is a biochemistry; it takes apart what photosynthesis puts together. Though patchy in space and time, fossil charcoal dates to the early Devonian. Then a creature acquired the ability to fire at will. Eventually, Homo sapiens held that capacity as a species monopoly - the Earth's keystone species for fire. To the ability to start fire was added the ability to create and rearrange fuels, and then to exhume and burn lithic landscapes from the geologic past. Humanity got small guts and big heads because it could cook food. It went to the top of the food chain because it could cook landscapes. It has become a geologic force because it can now cook the planet. From the smoking snag to the SUV - it's time to consider the long narrative arc of fire.

Quintero-Gradilla, Shatya

Shatya is a doctoral candidate in Ecology and Natural Resource Management at the University of Guadalajara, in Mexico. She has worked in the environmental services program of the National Forestry Commission (CONAFOR). Currently, she researches fire effects on carbon ecosystem pools in forests of western Mexico.

Ecosystem carbon pools recovery after stand-replacing wildfires in México

Oral Presentation

In fire prone forest ecosystems, fire suppression can increase carbon emissions in forest stand-replacement events. We measured carbon (C) pools in a post-fire chronosequence of 8, 28, and 60 yr-old Pinus douglasiana stands, following stand-replacement fires, in central-western Mexico. The relative contribution of each C pool to total ecosystem C varied with stand age. The live biomass pool was severely affected by fire: 8 yr-old stands had < 70% less carbon than 28 and 60 yr-old stands. Conversely, these stands contained higher stocks of deadwood C, which dramatically decreased with stand age. Forest floor mass was significantly lower 8 years after fire, but 28 yr-old stands had similar amounts as 60 yr-old stands. Soil mineral C storage in the 8 yr- was 25% less than

60 yr-old stands. While our results show that stand-replacement fires significantly affect C ecosystem storage, they also suggest a fast recovery of C pools, due to the high productivity and fast regeneration of P. douglasiana in subtropical lower montane moist forests. Forest managers must consider the potentially higher C emissions caused by the increased severity of wildfire due to fire suppression, and incorporate fire management in climate change mitigation and adaptation policies and plans.

Ramos, Desirée

Desirée Ramos is a Ph.D. student in botany at the University of Brasilia, Brazil. She is interested in plant reproductive ecology, with emphasis on phenology and seed germination of grass species from Brazilian savannas. She is particularly interested in the evolution of seed dormancy and its implications for fire tolerance in grasses.

Tolerance to heat shock is better predicted by seed dormancy than by habitat type for grass species from Brazilian open savannas and wet grasslands

Poster Presentation

Open savannas and wet grasslands occur under the same macro-climate in central Brazil, with wet summers occurring from Oct to April and dry winters from May to Sept. Grasses dominate both ecosystems, however, open savannas are dryer and fires are more intense than in wet grasslands. Previous results have shown that seed dormancy varies between species but the effects of fire on seeds have not been tested. We hypothesize that seeds of species from open savannas are more tolerant to heating than those of wet grasslands. Also, considering that dormant seeds might remain longer in soil than non-dormant seeds, thus being more likely to burn, we expect that dormant seeds are more tolerant to heating than non-dormant seeds. We therefore tested the effects of heating at 80 and 110°C for 2.5 and 5.0 min on the survival of seeds of 14 species, 7 from each community. Seeds of most species survived at 80°C, but seeds from open savannas maintained greater survival at 80°C for 5 min than seeds from wet grasslands. Seeds of most species died at 110°C, but dormant seeds survived more than non-dormant seeds under these treatments. We conclude that dormancy in seeds is a better predictor of a species tolerance to heating than their habitat.

Reed, Warren

Warren Reed is a Graduate Research Assistant at Penn State University where he is currently pursuing a Ph.D. in Forest Ecology. His M.S. research at Virginia Tech focused on the efficacy and longevity of masticated fuels treatments in northern California and southern Oregon. He has been a member of SAFE for two years.

Long-term changes in masticated woody fuelbeds in northern California and southern Oregon

Oral Presentation

The use of fuels treatments is increasing as a forest management strategy across fire prone ecosystems of North America. One common fuels treatment is mechanical mastication, which crushes and shreds small midstory trees and shrubs into a compacted layer of shredded surface woody fuel. A major question facing fuels managers is the longevity of mastication treatments and how fuelbeds change over time. We measured surface fuel loading at 25 masticated sites with a diverse range of stand characteristics and times since treatment (1- 16 years) in northern California and southern Oregon. We capitalized on the opportunity to revisit 7 previously sampled fuels treatments to investigate how surface fuelbeds transition over time. Surface woody fuel loading varied across sites and ranged from 12.1 to 92.0 Mg ha-1 and decreased with time since treatment by an average of 2.3 Mg ha-1 per year. Across all sites, 62% of fuels were concentrated in the 1 and 10-hour classes. In sites where previously measured data exist, 1-hour and 10-hour woody fuels averaged 69% and 33% reductions in mass respectively after 8-9 years. Since fine fuels drive surface fire behavior and spread, our findings will be useful in planning and maintenance of masticated fuels treatments.

Reemts, Charlotte

Charlotte Reemts, Research and Monitoring Ecologist for the Texas Chapter of The Nature Conservancy, has been researching fire effects on various vegetation communities in Texas for more than 10 years. Her most recent grant focuses on thinning as a climate adaptation strategy for ponderosa pine communities in the Texas sky islands.

Using the Floristic Quality Index to assess long-term effects of prescribed fire and grazing on a prairie remnant

Oral Presentation

Tallgrass prairie is one of the most converted vegetation types in the United States, making unplowed prairie remnants important reservoirs of biodiversity. Understanding how to manage these remnants is critical, since they can be invaded by shrubs or non-native plants without active management. We investigated the use of the Floristic Quality Index (FQI) to measure the long-term effects of grazing and prescribed fire on a prairie remnant in the Blackland Prairie Ecoregion (Texas). FQI is calculated as aveC*sqrt(N), where aveC is the average Coefficient of Conservatism and N is the total number of species. Coefficients of Conservatism were assigned to Blackland Prairie plants by regional experts and ranged from 10 ("conservative" species that are found only in high quality, remnant prairies) to 0 (species found primarily in disturbed sites). Between 1996 and 2015, both cover and species richness of forbs increased; cover and species richness of graminoids was generally constant. FQI increased in most stands, but this increase was driven largely by the increase in forb species richness, rather than an increase in conservatism of the species present. While more conservative species have become more common in the study site, they are still too rare to influence overall FQI.

Targeted thinning as a climate adaptation strategy in sky islands

Poster Presentation

Sky islands—isolated mountains in desert "seas"—are an important feature of the American Southwest. Because of their elevation and cool, wet climate, these sky islands harbor many species not found in the surrounding deserts. Many sky island species are small, isolated, relict populations that are particularly vulnerable to the increased temperatures and droughts predicted by climate change models. Like many other forest systems in the west, pinyon-juniper and ponderosa pine woodlands in the Davis Mountains of west Texas have very high tree density after a century of fire exclusion. This high tree density has led to high mortality during recent droughts and wildfires, as well as outbreaks of bark beetles. Since early 2015, we have been conducting thinning in the Davis Mountains as a climate adaptation strategy. We anticipate that thinning will restore historical low-severity fire regimes, reduce tree competition for water, and decrease beetle outbreaks. We are concentrating our thinning on mesic canyons in the upper elevations of the Davis Mountains. These canyons have the highest tree density and, because they are the coolest and wettest part of the landscape, will likely serve as refuges for many species under climate change.

Reilly, Matthew

Matt Reilly is post-doc at Oregon University where his current research focuses on regional forest change in Pacific Northwest.

Post-fire structural variation in forests of Oregon Washington, and N. California

Oral Presentation

Wildfires have been increasing in extent across the western United States and there is much concern about the effects of high severity fire. Our current understanding of regional scale fire effects is derived primarily from remote sensing studies validated with rapid field assessments based on ocular estimates of changes across multiple vegetation strata. This approach has been extremely effective and provides the basis for most of our knowledge regarding trends and patterns of fire severity, but there is little understanding about the range of post-fire structural conditions at any given level of severity. We integrate a regional fire atlas and post-fire data from over 700 field plots in Oregon, Washington, and Northern California and examine the range of post-fire structural conditions across all levels of severity. We found a wide range of variation in live and dead structure at all levels of severity, but most notably at high severity where variability in the number of big, remnant trees indicates a wide range of ecological effects associated with high severity fire. Results have the potential to improve the ecological resolution of remotely sensed metrics of fire severity and provide a more holistic view of the effects of contemporary wildfires.

Reimer, Rachel

Rachel Reimer, M.A. Leadership Studies Candidate, Royal Roads University; and Initial Attack Crewleader, British Columbia Wildfire Service. Rachel previously earned a B.A. in International Development Studies from the University of Winnipeg (2010), and completed research with the United Nations Relief and Works Agency, Lebanon on women leaders in Palestinian refugee camps. She is currently a candidate for the M.A. in Leadership Studies through Royal Roads University, Victoria. She is also a wildland firefighter, leading an Initial Attack crew with the British Columbia Wildfire Service based in the Fraser Canyon, in Lytton, B.C. This is her fifth season in wildland fire. She is conducting research on gender and leadership in wildfire suppression as part of her M.A. in Leadership Studies, and is an independent researcher working within the British Columbia Wildfire Service.

Gender and Leadership in Wildfire Suppression: Women Leaders on the Fireline

Student Poster Presentation

Recent research has characterized wildland firefighting as a "highly masculinized occupation" (Pacholok, 2013, p. 13) and as a "means through which traditional gender roles and power relations are maintained" (Eriksen, 2014, Intro para. 3). The "marginalisation of emotion" and a "masculine way of engaging with risk" in the ranks of wildfire suppression agencies have necessitated that women engaging in fireline roles must comply with and model the masculine culture (Eriksen, 2014, p. 129). There is a cultural belief that "good firefighters are masculine, and bad firefighters are unmasculine or feminine" (Pacholok, 2013, p. 55). And yet there are women in fireline positions of leadership who constitute "boots on the ground" - whose daily "micro-level, face-to-face interaction(s) can also spark change" (Pacholok, 2012,p. 113). This study seeks to understand if / how women in operational, fireline-based positions of leadership are creating and sustaining positive change in wildfire suppression. This research is in the beginning stages, and has support from within the British Columbia Wildfire Service. It will follow Participatory Action Research as a guiding methodology, and is research for and by wildland firefighters and is gender-inclusive.

Reinhardt, Elizabeth

Elizabeth is Assistant Director of Fire and Aviation Management for the Forest Service, with responsibility for fuels and fire ecology. Previously she was the Forest Service National Program Leader for Fire Research. She started working for the Forest Service as a seasonal employee in 1978 and spent most of her career at the Rocky Mountain Research Station's Missoula Fire Sciences Laboratory where she was a research forester. Her research focused on fire ecology and wildland fuel treatment. She is a principle developer of FOFEM (a First Order Fire Effects Model) and FFE-FVS (the Fire and Fuels Extension to the Forest Vegetation Simulator. She served as Project Leader of the Fire Ecology and Fuels Project, and the Director of the Fire Modeling Institute for several years. In 2009 she came to Washington DC as a member of the Policy Analysis staff, and then served in the Climate Change Advisor's Office for two years as staff assistant. She has degrees in English (A.B., Harvard University), and forestry (M.S. and Ph.D., University of Montana).

Fuel Management in the US Forest Service -- Aspirations and Reality

Oral Presentation

The Forest Service is deeply committed to proactive management of fuels as a tool for wildland fire management. Despite significant investment and millions of acres of treatment, wildfire continues to challenge our agency. This presentation summarizes our progress and challenges in using prescribed fire, wildfire, and mechanical treatment including harvest as means to mitigate wildfire extent and severity. What do we hope to accomplish? How does our program need to adapt to the challenges of changing human landscapes, climate, and political environment? What are the limitations to our approach?

Ecological and Social Imperatives for Managing Wildfire

Oral Presentation

The Federal Land Management Agencies are responsible for land stewardship for the National Forests, National Parks, National Wildlife Refuges, and many Wildernesses and other public lands and also have responsibilities toward protecting life and property (often off the public lands) from wildfire. This presentation focuses on the common ground between these two seemingly disparate missions. Managing wildfire is an integrative approach to increasing ecological resilience and reducing risks of unwanted wildfire. It is not an easy solution however. This presentation discusses what we as a federal land and fire management community are doing and need to do to better manage fire and thus manage our nation's lands and protect communities.

Reis, Schyler

Schyler Reis is a Graduate Research Assistant studying Wildlife Science at Oregon State University, the Department of Fisheries and Wildlife.

Dynamics of Fuels Accumulation in Mountain Shrub Communities at Hart Mt. National Antelope Refuge.

Oral Presentation

Current threats to high elevation, mesic mountain big sagebrush ecosystems include the alteration of fire regimes due to fire suppression and the introduction of invasive species. Mountain shrub communities within the sagebrush biome had a historic mean fire return interval of 10-25 years, but much less frequent fire since Euroamerican settlement. In order to better understand patterns of fuels accumulation following fire, we measured live herbaceous, standing dead, grass litter, shrub litter, shrubs, and downed woody fuels in sites burned 29 years previously and in unburned control plots at Hart Mountain National Antelope Refuge. Total aboveground fuel loads averaged 28.7 Mg/ha in unburned controls and 8.2 Mg/ha in 29 year old burns. Shrub fuel loads averaged 16.4 Mg/ha in controls and 5.3 Mg/ha in burns. Shrub litter averaged 9.2 Mg/ha in controls and 0.8 Mg/ha in burns. Downed woody fuel was 0.9 Mg/ha in controls and 0.1 Mg/ha in burns. There were no differences in live herbaceous, standing dead, or grass litter fuels between 29 year old burn and control sites. A greater understanding of the dynamics of fuels accumulation in the sagebrush steppe is critical for fire and wildlife habitat management, as well as for maintaining overall ecosystem resilience.

Restaino, Joseph

Joseph Restaino is a Research Scientist at the University of Washington, and is affiliated with the Fire and Environmental Research Applications Team within the Pacific Wildland Fire Sciences Lab (USFS: PNW Research Station).

Pile age and season of burning influence combustion and fire effects

Poster Presentation

Pile burning is associated with fuel reduction treatments in dry western forests to reduce the quantity of unmerchantable woody material remaining on site after harvest. We quantified the effects of pile age and season-of-burn on fuel consumption, charcoal production, soil heating, and vegetation recovery post-fire over three years in central Washington and north-central New Mexico. Five hand piles in each age/season combination were burned in each location. Fuel consumption and charcoal production ranged from 86 to 99 percent and 0 to 2 percent of pre-burn biomass, respectively. Soil heating, which was measured with an array of subsurface thermocouples located at various depths (0-30 cm) and distances (0-1.4 m) from the pile center, showed that maximum temperature and duration of temperature above 60 °C are both higher near the center of piles. There was little difference between fall and spring burns in maximum soil temperatures, although fall burns registered 20-40% greater duration of temperature above 60 °C at the soil surface and 5-cm depth near the pile center. Perhaps related to this spatial pattern of soil heating, post-fire vegetation recovery appears to be less near the pile center relative to the pile edge, at least for the first 1-2 years post-burn.

Rhoades, Charles

Chuck Rhoades is a research biogeochemist at the US Forest Service, Rocky Mountain Research Station, Fort Collins, CO. He studies the implications of bark beetle outbreaks, wildfire and other disturbances and land management practices on watershed and ecosystem processes that regulate delivery of clean water and maintain productive soils and forests.

Fuel reduction mulching treatments, nitrogen dynamics and site productivity in Colorado conifer forests

Oral Presentation

Fuel reduction mastication/mulching treatments add low-nitrogen (N) woody material to the soil surface. This relatively-new practice may have lasting effects on soil N and forest productivity in conifer ecosystems. We have spent the past decade examining mulching in pinyon-juniper, montane, and subalpine forests of the Southern Rockies, USA. Deep mulch (15 cm) reduced plant-available-soil N the year after application, though this negative effect did not persist and was not generally evident in shallow mulch or comparisons of mulched and untreated stands. On average, mulch N content increased from 0.2 to 0.6% and C:N declined from 230 to 71. Mulch decay rate (k value) was about 0.1 yr-1 and 40-50% of added mulch was lost over the course of the study. Decomposition and N changes increased with the depth of applied mulch in montane and subalpine forests. Mulching also enhanced soil moisture and net nitrification, and trees planted in mulched areas grew better for those forest types. The effects of mulching on soil N and productivity differ among forest types and site locations, due to climate, soil conditions, tree stocking, fuel reduction prescriptions and other factors. However, our research finds little indication that forest mulching is detrimental to these ecosystem processes.

Rideout-Hanzak, Sandra

Sandra Rideout-Hanzak is an Associate Professor and Research Scientist in the Dept. of Animal, Rangeland and Wildlife Sciences and the Caesar Kleberg Wildlife Research Institute at Texas A&M University-Kingsville. She studies fire effects on endangered plants as well as non-native, invasive plants, and she is a lead burn instructor for the Texas Certified Burn Managers Program.

Using prescribed fire to manage endangered slender rush-pea (Hoffmannseggia tenella) in southern Texas, USA

Oral Presentation

Slender rush-pea (Hoffmannseggia tenella) (SRP) is an endangered herbaceous legume endemic to South Texas. Agricultural expansion and non-native, invasive grasses have reduced its range and threaten populations. We compared effects of four management treatments—summer prescribed burning, chemical neighbor removal, mechanical neighbor removal, and no management (control). Active management treatments produced more main stems compared to control plants. Prescribed burning and/or chemical neighbor removal resulted in more leaves and flowers than control plants. Prescribed burning produced longer stems than control plants at two sampling dates. SRP with more main stems, longer stems and more leaves may be more robust and resilient to environmental stress, and more flowers may indicate enhanced reproduction. SRP displays morphological plasticity in response to environmental conditions, and may benefit from prescribed burning regimes or reduced competition. We compared species diversity, richness, evenness and community composition in 1-m2 quadrats centered around either SRP plants that were burned, plants that were not burned, or at random points. Burn treatments had lower evenness and more variable community composition than control treatments. Diversity was higher in control treatments than in random plots. Burn treatments had different species composition than control treatments, whereas composition was similar between random and control treatments.

Heat, smoke and smoke water effects on germination

Oral Presentation

We exposed viable seeds of blue grama (Bouteloua gracilis), sideoats grama (Bouteloua curtipendula), buffalograss (Buchloe dactyloides), little bluestem (Schizachyrium scoparium), big bluestem (Andropogon gerardii), Maximilian sunflower (Helianthus maximiliani) and Illinois bundleflower (Desmanthus illinoensis) to smoke/heat from prescribed fires, or to smoke water (Colgin or Wright's solution). Seeds treated with smoke/heat were placed in stainless steel fine mesh packets on the ground or at 1-m height within burn plots and left intact during smoldering. Seeds treated with smoke water were soaked in 1:10 smoke water to distilled water for 24 hours. Seeds were placed on moistened filter paper in Petri dishes, and incubated at 30 C in light for 12 hours alternating with 20 C in dark for 12 hours. Germination was monitored daily until no new germination occurred. Smoke and smoke water reduced germination of sideoats grama, blue grama and Maximilian sunflower. Although there were no statistical differences between smoke water and smoke treatments, we observed no germination of any species in smoke water treatment. The absence of germination in any species in smoke water treatments raises the possibility that, despite lack of statistical significance, smoke water may not have the same effects on seed germination as smoke.

Riley, Karin

Dr. Karin L. Riley is a Research Ecologist with the Rocky Mountain Research Station of the US Forest Service in Missoula, Montana and the current Vice President of Association for Fire Ecology. She is an editor in chief of an American Geophysical Union monograph on uncertainty in natural hazards which is currently in press, in which she authored a chapter on uncertainty in wildfire modeling.

Advancements in Spatial Wildfire Risk Analysis

Oral Presentation

In this presentation, we review recent advancements in spatial wildfire risk analysis, focusing on the use of simulated fire perimeters. To date, stochastic fire spread models have more commonly been used to provide landscape-level outputs such as gridded burn probabilities and flame length distributions, common inputs into spatial risk calculations. However, spatial analysis of the individual simulated fires themselves - specifically their size, shape, and location - provides a complementary and richer characterization of patterns of risk. Our review begins with a discussion of the status of fire perimeter modeling in a contemporary large fire simulation system (FSim). Second, we describe the role of simulated perimeters for a range of applications and introduce three key risk modeling metrics: (1) conditional distributions of fire-level impacts; (2) exceedance probability charts; and (3) risk associated with ignition location. We illustrate perimeter-based assessment of risk to municipal watersheds and human communities, and identify opportunities for fuel treatment evaluation and spatial response planning culminating in fire suppression response zones. Third, we describe integration with fire cost modeling and the predictive improvements afforded by analysis of perimeters. To conclude, we discuss opportunities for more complete identification, evaluation, and prioritization of cost-effective wildfire risk management options.

An Uncertainty Analysis of Wildfire Modeling

Oral Presentation

In order to effectively apply fire models to support decision making, we identify and classify sources of uncertainty using an established analytical framework and summarize results graphically in an uncertainty matrix. We characterize the underlying nature of each source of uncertainty (inherent variability versus limited knowledge), the location in which it manifests within the modeling process (inputs, parameters, model structure, etc.), and its magnitude or level (on a continuum from total determinism to total ignorance). We adapt this framework to the wildfire context across different planning horizons facing fire managers (near-, mid-, and long-term) as well as modeling domains that correspond to major factors influencing fire activity (fire behavior, ignitions, landscape, weather, and management). Key findings include that uncertainties compound and magnify as the planning horizon increases, and that while many uncertainties are due to variability, gaps in basic fire spread theory present a major source of knowledge uncertainty. Despite uncertainty, models are empirically tuned to represent fire behavior sufficiently for application in planning and during wildland fire incidents. Systematically recognizing sources of uncertainty can help analysts understand modeling choices and model outputs, and help managers determine confidence in model predictions and balance the costs of investing in more research.

Ritter, Scott

Scott Ritter is a Graduate Student at Colorado State University conducting research on the interactions between fire and dwarf mistletoe populations and the effects of dwarf mistletoe on fuel loading in lodgepole pine dominated forests. He is also a Graduate Teaching Assistant in CSU's Warner College of Natural Resources.

The Impact of Crown Fire on Dwarf Mistletoe Populations Thirty Years Post-Fire

Student Poster Presentation

Lodgepole pine dwarf mistletoe is an obligate hemiparasite that infects lodgepole pine throughout its range resulting in decreased growth rates, abnormal tree morphology, and altered stand structure which creates unique fuels complexes and increased fire hazard. Stand replacing wildfires have long been thought to control dwarf mistletoe populations at the landscape scale by killing infected trees and allowing uninfected regeneration to reclaim the site. Previous research has shown that fires resulting in between 70 and 100 percent mortality can substantially reduce or eliminate dwarf mistletoe within the burned area. However, there is little information available about the long-term changes in dwarf mistletoe population levels, the fuel loading, or fire hazard. To investigate these questions we resampled 3 prescribed crown fires conducted in severely infested dwarf mistletoe lodgepole pine forests in 1982 and 1983 on the Gunnison National Forest. Using this data we will present findings on the impact that differential levels of mortality had on the dwarf mistletoe population, surface fuel loadings, and the predicted future trajectory of the stands.

Robertson, Kevin

Kevin Robertson received his BS in Botany from Louisiana State University and Ph.D. in Plant Biology at the University of Illinois. He is currently the Fire Ecology Program Director at Tall Timbers Research Station and Land Conservancy. There he studies the plant community ecology of southeastern U.S. pine ecosystems, the natural history of the Gulf Coastal Plain, remote sensing of fire, effects of fire regime on plant communities, soils, and fire behavior, and prescribed fire effects on air quality. He also provides extension and education regarding the use of prescribed burning in fire-dependent ecosystems of the southeastern U.S.

Fire environment effects on particulate matter emission factors in southeastern U.S. pine-grasslands

Oral Presentation

Particulate matter (PM) emission factors (EFPM), which predict PM emissions per biomass consumed, have a strong influence on PM emission inventories. PM < 2.5 mm diameter (PM2.5) is of special concern for human health. EFPM2.5 is typically held constant for the region or general fuel type being assessed. This study used structural equation modeling (SEM) to measure effects of fire environment variables on EFPM2.5 in U.S. pine-grasslands to refine their application in emission inventories. An a priori model was tested using 41 prescribed burns in Florida and Georgia, USA with varying years since previous fire, season of burn, and fire direction of spread. The SEM showed EFPM2.5 to be higher in burns conducted at higher ambient temperatures, corresponding to later dates from winter to summer and increases in live herbaceous vegetation and ambient humidity, but not total fine fuel moisture content. Pine needles had the strongest positive effect on EFPM2.5, and grass had a negative effect on EFPM2.5. Results of the study suggest that timber thinning and frequent prescribed fire minimize EFPM2.5 and total PM2.5 emissions on a per burn basis. Further development of PM emission models should consider adjusting EFPM2.5 as a function of these common land use variables.

Robichaud, Peter

Peter Robichaud is a Research Engineer with the USDA Forest Service, Rocky Mountain Research Station, Air, Water and Aquatic Environments Science Program in Moscow, Idaho. Pete has been studying and modeling soil erosion as affected by wildfires, prescribed fires, and timber harvesting for the past 25 years. His field research includes plot-scale infiltration, erodibility studies, small-catchment paired watershed studies and large-scale remote sensing projects. He is an international leader in post-fire hydrology effects, erosion mitigation and monitoring techniques. He leads various research teams including the team that developed the popular web-based probabilistic Erosion Risk Management Tool (ERMiT) for post-fire assessments.

Smoldering Questions: Are Better Post-fire Decisions Being Made?

Oral Presentation

Major advances have been made over the past 15 years in assessing post-fire conditions that coincide with the escalating effects of climate change which has amplified the number, size, severity, and cost of wildfires. Increased flooding and erosion risks are common after major wildfires since the number of people living in wildland areas has also grown along with the expanding wildfire-urban interface. To reduce post-fire flooding and erosion potential, various erosion control and rehabilitation treatments are applied to burned hillslopes and roads. However, to make the best use of limited rehabilitation funds, an assessment of fire effects on soils, in conjunction with local climate and watershed characteristics, is needed to identify burned areas that are most prone to increased flooding and erosion. Field and laboratory studies, synthesis documents, and computer models have all been used to develop tools that expedite and improve post-fire risk assessments. Post-fire decision-making is now being supported by these tools which incorporate knowledge of fire effects, flood and erosion prediction, risk assessment, and economic valuation of resources that are applied in post-fire treatment selection. These new tools are readily available, convenient, and workable within the time constraints of post-fire decision making.

Roccaforte, John

John Paul Roccaforte, Research Specialist, Sr., Ecological Restoration Institute, Northern Arizona University, has worked in the field of ecological restoration research for 20 years. His research interests include restoration and fire ecology, fire behavior modeling, and post-wildfire effects. He has worked at various sites in frequent-fire forests of Arizona, New Mexico, Colorado, and Mexico. He has published results from a long-term landscape-scale restoration project at Mt. Trumbull in northwestern Arizona. More recently he has published a study evaluating post-wildfire fuels and regeneration dynamics throughout Arizona.

Forest structure and fuels dynamics following ponderosa pine restoration treatments, White Mountains, Arizona, USA

Oral Presentation

Southwestern ponderosa pine forests have become uncharacteristically dense as a result of intensive livestock grazing, logging, and fire exclusion, which have contributed to fuel buildup and increased vulnerability to high-severity, landscape-scale crown fires. In 2002, we implemented a replicated ecological restoration experiment to quantify site-specific reference conditions, analyze effects of elevation on forest structure and canopy fuels, and evaluate treatment effectiveness for restoring attributes to near historical reference conditions. In 2002, before treatment, basal area (BA) averaged 28.9 m^2 ha-1 and density averaged 927.9 trees ha-1, representing three- and ten-fold increases, respectively, compared to 1880 values. By 2013 (5-years post-treatment), the full treatment showed BA was reduced by 52% and density was reduced by 85% compared to pre-treatment values. In the burn-only treatment, BA increased by 6% although density was reduced by 25% between 2002 and 2013. Canopy fuels dynamics were similar to forest structure responses: low values prior to fire exclusion, a marked increase by the pre-treatment measurement, substantial reductions following thinning plus burning, and minor reductions following burn-only treatments. Of the treatments tested, the full treatment was the only one that rapidly shifted forest structure and canopy fuels values to levels near or within the historical reference conditions.

Rothberg, Scott

Scott Rothberg, PhD Student Design Construction and Planning. University of Florida. Research led to the creation of the Heart of Florida Climate Change Workshop; The workshop was the first strategic planning opportunity for non-coastal counties in Florida's fire-dependent interior.

A Revised Brown's Method: Improving Fire Behavior Modeling

Oral Presentation

Inopportunely, geographic information systems (GIS) have been integrated into fire simulation analytics but GIS has not been used to improve upon the core method of surveying fuels on the landscape. With the ease of access to data now available to public agencies and private landowners, GIS has seen prolific growth as a means to visually organize inputs required by fire simulators and qualitatively analyze outputs from simulations. The Brown's Planar Intercept method has waited idly for an opportunity to use the features available in GIS to extrapolate transects across space. Fuel load measurements from field surveys have been limited to plot comparisons because measurements are not readily transferable to similar ecosystems within a study area without creating a homogenous swath of identical fuel loading. This research explores the hypothesis that transects of fuel loading from specific points distributed across a large landscape can be used to create a fabric of spatially correlated fuel loading. Subsequently, a set of customized fuel models for a large landscape can be created for use in fire simulation software. This research produced custom fuel models with greater precision across the study landscape without losing statistical significance.

Rother, Monica

Monica T. Rother is currently a fire ecologist at Tall Timbers Research Station in Tallahassee, Florida. Her research interests include fire ecology, biogeography, the ecological consequences of climate change, dendrochronology, and fire-vegetation feedbacks. She completed her PhD at CU-Boulder in 2015, under the mentorship of Dr. Thomas T. Veblen. She earned her MS from UT-Knoxville, under the mentorship of Dr. Henri D. Grissino-Mayer.

Limited conifer regeneration following wildfires in low-elevation forests of the Colorado Front Range

Oral Presentation

We examined post-fire conifer regeneration in six recently burned ponderosa pine forests of the Colorado Front Range. Our primary research objectives were to: (1) quantify post-fire conifer establishment and survival, and (2) examine the spatial variability of juvenile conifer densities in relation to site factors such as fire severity, competition with herbaceous and woody species, distance to seed source, and topographic variables including elevation and aspect. We found that juvenile conifer densities were generally low across the study area, although dense patches of regeneration were observed in some locations. Random Forest analysis indicated that elevation, aspect, and distance to seed source were the most important predictors of post-fire regeneration by ponderosa pine and Douglas-fir. Juvenile conifers were most likely to be present in relatively mesic topographic settings (i.e. higher elevations and more northerly aspects) and where distance to seed source was less than c. 50 m. Our findings indicate that in some areas, current densities of juvenile ponderosa pine and Douglas-fir are insufficient to regenerate forests similar to those that were present prior to disturbance.

Sáenz Ceja, Jesús

Name: Jesús Eduardo Sáenz Ceja Title: Dendrochronological reconstruction of the establishment history of Pinus pseudostrobus and Abies religiosa in the Monarch Butterfly Biosphere Reserve Affiliation: Instituto de Investigaciones en Ecosistemas y Sustentabilidad (IESS), Universidad Nacional Autónoma de México (UNAM) He is student of the UNAM´s Graduate Program in Biological Science. He has collaborated with the Forest Resources Management and Ecology Laboratory in the IESS, on the study of the effects of natural and human disturbances on conifer forests of the Monarch Butterfly Biosphere Reserve, and their implications for the fire management.

Dendrochronological reconstruction of the establishment history of Pinus pseudostrobus and Abies religiosa in the Monarch Butterfly Biosphere Reserve

Oral Presentation

Information about the establishment history of conifer populations and their relation with fires is extremely scarce in tropical moist montane forests. In the Monarch Butterfly Biosphere Reserve (MBRR) are dominated by Pinus pseudostrobus and Abies religiosa monodominant or codominant stands. In this study, we determined the altitudinal ranges occupied by monodominant and codominant species of these species, and reconstructed their establishment history in each type of stand. We established six altitudinal transects along the MBRR, starting at elevations of 2400 and we selected sampling sites at every 150 meters of elevation. In each site, we took cores from 25 trees with diameter of each tree. Our results indicate that P. pseudostrobus is dominant from 2400-2850 m, A. religiosa is dominant from 3150-3300 m and they are codominant between 2850-3150 m. The establishment in both species has been continuous in monodominant and codominant stands. This suggests that the disturbance regimes have been severely modified by human activities. As a consequence, both species may have experienced similar disturbance regimes by fires.

Saito, Kozo

Kozo Saito, Professor in Mechanical Engineering and Director of Institute of Research for Technology Development at the University of Kentucky, specializes combustion, fire research, scale modeling and lean production (mono-zukuri) system. He has been the chair of International Scale Modeling Committee and is interested in the application of scale modeling to all areas of engineering and sciences including fire research.

Fire Whirls in Wildalnd Fires

Oral Presentation

Studies of fire whirls are our current interest because of the fundamental curiosity of the mechanism that governs complex fire-whirl structure and its hazardous impacts to the environment. They accelerate fire spread and promote spread by fire brands that create spotting fires. Most fire whirls only last for a rather short period of time, while their impact to the environment could be significant. Fire whirls can cause serious damages in firefighting efforts, and firefighters' safety. The transient nature of fire whirls, however, is not well understood. Research has been conducted at both the fundamental level and in reconstructing efforts for particular types of fire whirl related accidents or tragedies. This paper reviews recent progress made in these fire whirl studies and point out the need for more studies on moving type fire whirs, scaling laws on fire whirls in wildland fires, and interactions between the spreading fire and fire whirls. Fire whirls may be formed by reorienting a horizontally oriented vortex (or several vortices) to the vertical direction using buoyant force. Recent new findings suggest that fire spread through the forest fire beds is not governed by radiation but by convective heat transfer associated with different types of vortex motion, small and large, periodic and sporadic, horizontal and possibly vertical. This paper addresses the possibility of formation of vertically oriented vortex motion during flame spreading process, and its effect on the fire spreading rate.

Salansky, Greg

Greg Salansky is the District Fire Management Officer on the Unaka Ranger District of the Cherokee National Forest. He is responsible for the fire management aspects of 186,000 acres and manages the North Zone fire effects monitoring program. The district prescribed-burns about 5,000 acres annually to increase native warm-season grasses, shortleaf and table mountain pine, and oaks; restore various wildlife habitats; and in general improve the resiliency of the forest. Greg represents the Cherokee in the Southern Blue Ridge Fire Learning Network. He serves on the Southern Area Incident Management Gold Team as well as Burn Boss RXB2 and Incident Commander ICT3. Greg believes in the need for and strives to apply appropriate prescribed fire in the southern Appalachians.

Long-term fire effects monitoring data help inform resource objectives and burn prescriptions in a long-suppressed fire-adapted eastern hardwood forest

Poster Presentation

The Cherokee National Forest (CNF) in Tennessee has been collecting fire effects monitoring data since 2002. CNF was an early adopter of what eventually became a USFS regional mandate to gather vegetation and fuels data on long-term, permanent plots. Data collection is one step in the adaptive management cycle. Managers compile information about community types including current and desired future conditions, then install plots within communities of interest, apply prescribed fire, and lastly, analyze pre- and post-burn data. Managers then determine whether short-term objectives were met. The hardwood forests of eastern Tennessee are fire-suppressed and multiple treatments will be required to move into maintenance phase burning. Objectives are revisited as conditions change, and data may support changes to the current prescribed fire regime, such as seasonality, intensity and return interval. CNF collects information on overstory and midstory structure and composition, understory cover and fuels. Repeat photography tracks visual changes across the landscape. Data indicates that after several treatments, oak seedlings are increasing in size and number, density of undesirable midstory trees is decreasing, and leaf litter has been reduced. Prescribed burning is successfully moving fire-adapted hardwood forests toward desired conditions and recreating a resilient landscape.

Satink Wolfson, Barbara

Barbara Satink Wolfson has been the Program Coordinator for the Southwest Fire Science Consortium for more than four years. She obtained her Master of Science in Forestry and Fire Ecology from Northern Arizona University.

Fires of Change: An art and science collaborative to better understand changes in fire, climate and society

Poster Presentation

In our first major attempt to engage the public, the Southwest Fire Science Consortium partnered with the Landscape Conservation Initiative and Flagstaff Arts Council to develop Fires of Change, a collaborative science and art project. Our goal was to strengthen the conceptual link between fire and landscape conservation science with the future of our communities in a changing climate. Employing art as novel media, we communicated the newest scientific ideas to non-science oriented audiences. As part of the project, we conducted a multi-day field trip with artists, managers and scientists. We visited the North Rim of the Grand Canyon to learn about their successful fire program and the Slide Fire to discuss the challenges of facilitating ecologically beneficial fire within a suppression strategy. During the field trips, artists, managers and scientists contributed to conversation about fire ecology, historical fire regimes, changes in the last century due to human intervention and changes attributable to climate change. The final exhibition took place in September and October 2015 in Flagstaff, Arizona. In conjunction with the Flagstaff Festival of Science, participating artists, scientists and managers gave paired oral presentations; and a New York Times journalist gave a keynote presentation. Here we discuss this project's successes and lessons learned.

Scasta, John

I joined the Department of Ecosystem Science and Management at the University of Wyoming in August of 2014 after completing my Ph.D. at Oklahoma State University. My research focuses on how disturbances and management influence animal distribution, parasites, plant community composition and structure, plant succession, and production. I have participated on 38 prescribed fires in 3 different states. Fires ranged in size from 0.1 acres to 340 acres in various rangeland fuel types. I have published fire-related research in Fire Ecology, International Journal of Wildland Fire, Rangeland Ecology and Management, Botanical Studies, EcoHealth, Southwestern Entomologist, and several other journals.

Fire Effects on Parasites of Livestock and Wildlife

Oral Presentation

Parasites of livestock and wildlife can reduce animal performance, reduce animal survival, increase exposure to disease, and increase management costs. Fire as an ecological disturbance to mitigate parasites had been recognized by indigenous tribes but may currently not be as well understood or applied as other strategies. Furthermore, anthropogenically altered fire regimes due to fire suppression may have negatively changed the regulation of parasites by fire in terms of frequency, extent, and intensity. A recent review of 24 studies has demonstrated the restoration of fire in natural areas can lead to reductions of ectoparasites without wings (ticks (Amblyomma and Ixodes spp.), chiggers (Trombicula spp.), fleas (Ctenocephalides spp.), and lice (Pediculus spp.)), ectoparasites with wings (mosquitoes (Aedes and Culex spp.) and flies (parasitic species within the order Diptera)), and endoparasites affecting livestock and wildlife (Haemonchus spp., Prostrongylus spp., and others). Furthermore, my research group has empirical data demonstrating the effects of patch-burn grazing as a fire restoration framework and the mitigating effects it has had on horn flies (Haematobia irritans) and face flies (Musca autumnalis) on cattle. Fire can reduce parasites directly through habitat modification and/or indirectly by inducing animal movements of livestock and wildlife.

Schiks, Tom

Tom Schiks has a BScEnv from University of Guelph and MScF from University of Toronto, and has worked on research projects in Canada's boreal forest with FPInnovations (Wildfire Operations Research Group) and Alberta's wildfire management agency (Alberta Agriculture and Forestry), including experimental observations of prescribed fire in fuel treatments and the provincial fuels monitoring program. His most recent research focuses on modeling fuel moisture and ignition probability in masticated fuels of the Canadian boreal. Tom is currently involved in research on fire behaviour, fire danger rating, and fire management as part of Doctoral studies at the University of Toronto.

Fuel moisture and fire behaviour in masticated fuels of Canada's boreal forest

Oral Presentation

Wildfire risk mitigation is a leading focus among wildfire agencies, and includes preventative approaches like fuel management to decrease potential for extreme fire behaviour and improve the likelihood that suppression resources will be effective. Mechanical mastication is a popular treatment type across land management agencies and the natural resources sector in western Canada, especially in wildland-urban interface zones and along various rights-of-way (e.g. natural gas pipelines). While the treatment increases crown base height and reduces fuel density via thinning, these aerial and understory fuels are redistributed into a compacted layer of fractured materials on the forest floor, influencing available fuel load, moisture dynamics, and fire behaviour. This presentation outlines our attempts to characterize the fuel moisture and fire behaviour properties of masticated fuels, through both controlled, laboratory-based experiments and in-situ field observations, and using both physical and empirical modeling. As these treatments are in close proximity to human activity, and therefore potentially subject to increased numbers of human-caused ignition sources, it is critical to understand when and how masticated fuels burn. Thus far in the boreal forest, a lack of research, and the inherent variability in the treatment itself, have left land managers, researchers, and the public questioning where we are in our scientific understanding of mastication treatments.

Schmidt, Martha

Martha Schmidt is a senior in the Rangeland Ecology and Management at the University of Idaho.

Long-term effects of burn severity on non-native plant cover

Student Poster Presentation

Effects of burn severity on post-fire non-native plant invasion is of great concern to managers and researchers, especially given predicted increases in large, high severity fires. However, fewer studies have focused on long-term (>10 year) non-native plant establishment and persistence. We analyzed non-native plant cover 12-13years post-fire to determine the effect of burn severity on non-native plants. We compared percent cover of non-native plant species between wildfires in southern California chaparral (2003 Old and Simi Fires) and dry ponderosa pine forests in central Colorado (2002 Hayman Fire). Preliminary analysis of the 12- or 13-year post-fire data show significantly higher non-native plant cover in the high severity burn (TukeyHSD, $p=0.02$) in the dry ponderosa fire, but no significant differences between burn severity classes for the chaparral ($p=0.15$) where non-native species were more abundant regardless of burn severity. While non-native species response to fire is clearly ecosystem specific, our data indicate that dry ponderosa forest types burned at high severity may be more susceptible to non-native plant invasion than those burned at lower severities. Therefore, mitigation of high severity burns should be a high priority of managers in dry ponderosa pine ecosystems where invasive plant establishment is a concern.

Schoeffler, Fred

Retired from the US Forest Service in 2007 after 34 years, all in wildland fire. The Payson Interagency Hot Shot Crew Superintendent for 26 years. Worked for the Pine/Strawberry Fire District in AZ and the Murphys Fire District in CA, involved in wildland fire and Firewise program. Still active in wildland fire. A self proclaimed Fire Weather Nerd researching, writing, and presenting on satellite water vapor imagery, dry intrusions and dry slots and other fire weather areas as they relate to fire behavior at various weather conferences in the US.

Human Factors Influenced the 30 June 2013 Yarnell Hill Fire Fatalities

Oral Presentation

On 30 June 2013, nineteen members of the city of Prescott Fire Department, Granite Mountain Hot Shot Crew were working on the Yarnell Hill Fire in west-central Arizona. During a period of intense outflow thunderstorm winds and extreme fire behavior, they left a perfectly viable safety zone and traveled downslope through an unburned brush-filled chimney and then into a bowl choked with dense chaparral fuel, where they died in spite of seeking refuge in their protective fire shelters. In September 2013, a Serious Accident Investigation Team (SAIT) concluded, among other things, that there were "no violations of policy or protocol." The author and numerous other experienced wildland fire supervisors contend that this is incorrect. Indeed, it is not possible to abide by the wildland firefighting policy and protocols and kill 19 me. And further contentions include that these men perished due to a number of human factors and a number of violations of protocol, namely failure to follow and heed the basic wildand firefighting rules enumerated in LCES, the Ten Standard Fire Orders and the Eighteen Watch Out Situations. Other human factors leading up to the fatalities included the Normalization of Deviance, Bad Decisions With Prior Good Outcomes, Groupthink, and an 'At All Costs' mentality in the Prescott Fire Department. The presentation is based on anecdotal, practical and scientific evidences. Keywords: Human Factors, Wildland Firefighting Rules, Risk Taking

Schwilk, Dylan

Dylan Schwilk is a fire ecologist and associate professor at Texas Tech University.

Dimensions of litter flammability: leaf size, decomposition, moisture and volatiles

Oral Presentation

In temperate forests, litter-driven surface fires are extraordinarily patchy and there is mounting evidence that differences in species-specific flammability contribute to this patchiness. Flammability of litter depends on the "afterlife" effects of dead plant material and we now have a good understanding of the major axes of flammability variation in such fires. Litter packing controlled by leaf size is the first-order effect on fire spread rate. Second-order effects, however, may involve interactions among traits and species. We investigated flammability and leaf litter traits of eight tree species in a temperate forest in monoculture and in mixture and found that 1) the interaction of volatile compounds and litterbed density contributed to observed non-additivity in flammability, 2) moisture loss rates and moisture effects on fire spread enhance flammability differences among species, and 3) decomposition rate influences flammability by increasing litterbed over time but this effect is predicted by particle size changes and not simply by mass loss rate. Understanding these mechanistic feedback effects may improve our understanding of past communities and including such effects in forest models may improve predictions of fire behavior in novel future communities.

Scott, Joe

Mr. Scott has more than 20 years experience in wildland fire science research, development and application. He has led projects related to surface and canopy fuel characteristics, wildfire behavior modeling, crown fire hazard assessment, and wildfire risk assessment. 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. Joe earned a B.S. in Forestry and Resource Management from the University of California at Berkeley and an M.S. in Forestry from the University of Montana.

The relative contribution of USFS land to wildfire risk to adjacent homes—a pilot assessment on the Sierra National Forest, California

Oral Presentation

Large wildfires expose homes loss far from their ignition locations, a phenomenon called "risk transmission". Risk transmission has previously been assessed by associating home exposure with the ownership at the start location. Although intuitive, that approach presents an incomplete picture of risk transmission. We designed and tested an alternative risk apportionment framework by generating a series of hypothetical fuelscapes—even those not possible to implement—and then simulating their effect on the exposure of homes to wildfire. The hypothetical fuelscapes varied in their extent and location of implementation, but were sensitive to biophysical limitations on what fuel treatment can reasonably accomplish. Our results indicated that implementing fuel management on USFS land nearest the homes was the most efficient of the fuelscapes that treated only USFS land. In fact, treating a small fraction of the USFS land nearest the homes was nearly as effective as treating all of the accessible USFS land. More interesting, treating the land nearest the homes—regardless of ownership—was by far the most effective and efficient strategy for mitigating home exposure. Our results further suggest that, on this landscape, USFS fuel management can have only mitigate a small fraction of the overall wildfire threat to homes.

Overview of effects analysis in a wildfire risk assessment framework

Oral Presentation

A quantitative wildfire risk assessment framework for land and resource management planning was published in 2013. That general framework has been implemented at a wide range of spatial extents, including a single wildfire incident, an individual fuel management project, a single national forest or park unit, all or part of a Forest Service region, and even the entire United States. Within the framework, Effects Analysis is the most complete assessment of the effects of wildfire. Effects analysis includes a full assessment of wildfire hazard (probability and intensity) as well as the vulnerability of resources and assets (their exposure and susceptibility to fire of various intensities). Although the framework nominally assesses the "risk" of wildfire, which carries a connotation of purely adverse fire effects, an effects analysis accommodates the assessment of beneficial effects along with any adverse effects. This presentation reviews the terminology, concepts and calculations of the framework, with special attention given to the use of the framework for quantifying the expected benefits of wildfire.

Application of landscape-scale wildfire risk assessment results to incident management

Oral Presentation

A landscape-scape wildfire risk assessment framework for land and resource management (Scott and others 2013) has been implemented at a wide range of spatial extents, including an individual fuel management project, a single national forest or park unit, all or part of a Forest Service region, and even the entire United States. The "Effects Analysis" portion of that framework can be used to produce raster data that depicts the conditional net effects of fire—whether positive or negative—given that a fire occurs. This presentation illustrates how this conditional net effects raster can be combined with stochastic simulations of a wildfire incident to characterize, using Exceedance Probability (EP) curves, uncertainty regarding the potential size and effects of an ongoing wildfire. Our example, set in the Sierra Nevada Mountains of California, uses FSPro to produce thousands of simulated fire perimeters up to four weeks into the future. The pixel-based conditional net effects values are summed within each simulated fire perimeter to produce a measure of the overall net effect of that wildfire. Finally, uncertainty in fire growth potential and corresponding effects is expressed using EP curves.

Seijo, Francisco

Francisco Seijo is a professor, researcher and consultant in environmental politics. His fields of expertise include climate change, forest policy, fire ecology and coupled human and natural systems theory and modeling. His work has appeared in leading scientific journals such as Environmental Politics, the Journal of Environmental Policy and Planning, Human Ecology Review, BioScience and Frontiers in Ecology and the Environment among others. More recently he has also co-edited a book with the europarliamentarian Florent Marcellesi for Editorial Icaria entitled "¿Que Europa queremos?" on recent developments in European politics. Dr. Seijo has also collaborated with various Spanish and international governmental and non-governmental organizations as a development consultant. He has also participated actively in the ongoing environmental and forest policy debate in Spain through opinion pieces in El Correo, Publico and Cadena SER.

Legacy effects of preindustrial era fire practices in Iberian forest ecosystems: Defining historical ranges of variability in two unevenly developed chestnut forest coupled human and natural systems

Oral Presentation

The study of coupled human and natural systems (CHANS) has emerged in recent times as a leading interdisciplinary research field in ecology because of the increasing complexity and spatial scope of human system variables on the natural environment. This is particularly the case for Mediterranean type forest ecosystems (MTEs) where anthropogenic disturbances have played a critical ecological and evolutionary role in the shaping of ecosystem structure and function and pristine wilderness conditions are practically non-existent. In this study we examine the ecological evolution of CHANS chestnut forests situated in two unevenly developed municipalities in central Spain: Casillas and Rozas de Puerto Real. The chestnut forest ecosystems of Casillas and Rozas have been exploited by humans for centuries and their landscapes have in turn been shaped by forms of land use, land tenure and fire use dating back to the region's preindustrial past. The industrialization and post-industrialization processes that started in Spain begginning in the late 1950s, however, significantly transformed these CHANS's past feedbacks. In this study we seek to answer four key ecological questions which could decisively condition the future management of these forest ecosystems: What are the legacy effects of pre-industrial forms of land use, land tenure and fire use on the contemporary chestnut forests in these sites? How have fire regimes changed as a result of the human system transformations taking place in these landscapes since the beginning of industrialization? What has been the impact of these fire regime transformations in current landscape structure and process? Finally, are present fire regime attributes of these ecosystems compatible with the historical range of variability that has allowed these chestnut forest ecosystems to thrive historically? To answer these questions this study has quantified the historical evolution of fire regime attributes based on official statistics, reconstructed the preindustrial era fire history of both municipalities through dendrochronological analysis, assessed the evolution of forest stand structure since the beginning of industrialization through aerial photographs and measured the relative evolution of competing tree species in both sites through Spain's National Forest Inventory data. The evaluation of historical and social range of variability concepts is a key component of current landscape management and their definition for chestnut forest ecosystems is of great importance to the entire Mediterranean basin where these forest ecosystems are widespread but face an uncertain future due to rural abandonment, climate change and the impact of state-led fire exclusion policies.

Sexton, Tim

Tim manages the Wildland Fire Research Development & Applications Program. Past work experience includes: District Ranger, National Fire Use Program Manager, National Fire Ecologist, FMO and Hotshot Superintendent. His assignments have taken him to California, Washington, Idaho, Oregon, Colorado, and Minnesota. He has served as a Type I IC in the Great Basin and as a Type II IC in the Rocky Mountain Region. He also served on Fire Use Management Teams as IC, PSC, OSC, and Fire Use Manager. Tim has a BA in History from Boise State University and an MS in Fire Ecology from Oregon State University.

Restoring Fire to North American Wildlands - A Call to Action

Oral Presentation

Restoring Fire to North American Wildlands - A Call to Action Fear of undesired outcomes, economic constraints, and opposition from some state and local government agencies has led to a reduction in using wildfires to achieve resource benefits on federal lands in the last few years. Hazardous fuel has continued to accumulate, ecosystems have continued to degrade, and costs of federal suppression programs have skyrocketed. Climate change will continue to exacerbate the impacts of fire exclusion on North American wildlands by creating episodic fire danger conditions that contribute to fire behavior that defies control efforts and burns at extreme levels of severity. Current practices by federal agencies closely mimic the twentieth century ten am ten acre policy and plan. Most wildfires occurring on federal lands are extinguished at less than 1 acre during the first operational period after discovery. It appears that the ten am, ten acre policy of aggressive suppression on almost all wildfires has not been abandoned. Aggressive suppression on fires that may threaten lives, property and important cultural and natural resources must continue. However, we need to stop suppressing those fires that, with careful management help achieve land management objectives while posing little threat to values.

Shen, Chen

Chen Shen, Brigham Young University. PhD student in Chemical Engineering at Brigham Young University, working with Dr. Thomas H. Fletcher. Expecting to graduate in 2016.

Experiments and Modeling of Fire Spread in Big Sagebrush and Chamise Shrubs in a Wind Tunnel

Oral Presentation

Fire spread in live shrubs (chamise and big sagebrush) was measured in a wind tunnel and used to validate a semi-empirical shrub combustion model. The fuel bed was designed to contain two shrubs in their natural arrangements (nominally 2 m long x 1 m wide x 1 m high). Shrub geometry dimensions were measured manually or determined from images. LiDAR scanning were also performed in some experiments to establish a 3-D voxel data matrix for potential fuel placement. Wind speed was held constant at 1.4 m/s while fuel density and moisture content varied across natural levels. Mass, fuel surface temperature, gas temperature, radiative heat flux and total heat flux data were collected throughout each experiment. Combustion characteristics and time-dependent fire behavior were measured continuously using three digital camcorders at different locations around the fuel bed. After the experiment, the terminal end diameter of burned branches was measured as an indicator of fire intensity. Results indicate that fire behavior under these conditions is highly dependent on species and fuel moisture content, overall fuel bed density, and local fuel density fluctuations. Comparisons of bush model simulations with the shrub combustion experiments show promise.

Shive, Kristen

Kristen is a PhD candidate in the O'Hara and Stephens labs in the Environmental Science, Policy and Management Department at UC Berkeley. Her dissertation focuses on how large patches of severe fire, as well as post-fire management treatments, affect vegetation communities.

”Weed-free” rice straw mulch introduces exotic species in California's 2013 Rim Fire

Student Poster Presentation

Straw mulch is commonly used for post-fire erosion control in severely burned areas. This practice can introduce exotic species, even when using certified weed-free straw. Rice straw is being promoted as an alternative to wheat straw, under the assumption that exotics established in a rice field are unlikely to establish in dry conifer forest habitat. We investigated this untested assumption in the 2013 Rim Fire of the Sierra Nevada. In 2014, we installed plots in mulched (51) and control (95) areas with ≥95% tree mortality, and re-measured a subsample in 2015. Three exotics were exclusively associated with mulch: Echinochloa crus-gali, Sorghum halapense and Persicaria maculosa. All had low covers and densities but persisted through 2015, invalidating the assumption that exotics from rice fields could not establish in drier habitat. Despite low densities, S. halapense is of particular concern as it is considered noxious in California. Mulching is also intended to increase plant cover, but we did not observe higher cover relative to control areas. Species richness was higher in mulched areas, but this was largely driven by higher exotic richness. We caution that rice straw may not be a "safe" alternative to wheat straw in terms of invasion risk.

Short, Karen

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.

Improved simulation of probabilistic wildfire risk components for the conterminous United States

Oral Presentation

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 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.

Sieg, Carolyn

Carolyn Sieg is a research ecologist with the Rocky Mountain Research Station in Flagstaff, Arizona. Since 2008 she and Rodman Linn, Los Alamos National Laboratory, have co-led a team in the refinement and application of the physics-based fire model, HIGRAD/FIRETEC. The team has explored the influence of bark beetle outbreaks on predicted fire behavior in three major forest types and documented some unexpected results. Recent comparisons of the model's predicted fire rate-of-spread revealed good agreement with observed rates-of-spread from real fires. These results provide increased confidence in using this model to explore potential fire behavior without actually setting a fire.

Physics-based fire model provides insights on fire spread following bark beetle-induced tree mortality

Oral Presentation

Severe bark beetle outbreaks have occurred in numerous forest types from Mexico to Canada in recent decades, often raising concerns about elevated fire hazard. Mixtures of live, recently dead, and dead trees whose needles have fallen to the ground add to the natural heterogeneity of forests and make realistic fire spread predictions quite challenging. We used a recently developed three-dimensional, computational fluid dynamics model, HIGRAD/FIRETEC, to explore fire spread in three forest types following bark beetle-induced tree mortality. This model accounts for the physical processes of combustion and heat transfer as well as spatial variability in fuels and fuel moisture. Simulation results have provided insights on how the amount and arrangement of dead trees influences predicted fire spread following bark beetle-induced tree mortality. Further, we have been able to explore the implications of varying wind speeds as well as turbulence effects using HIGRAD/FIRETEC. During the early phases of an outbreak when dead needles remain on the trees, fire hazard is often amplified, but as needles drop to the ground crown fire spread is often dampened. But, unexpected amplifications were predicted -- especially under low wind speeds and sometimes with low levels of tree mortality.

Singh, Randeep

Presently I am working as an Assistant Professor in Amity University, Uttar Pradesh. India. I have completed PhD at the department of Animal Ecology and Conservation Biology at Wildlife Institute of India. I have published 16 scientific research papers and have authored two book chapters. The areas of research interest in carnivore ecology, ire ecology, species distribution modelling, landscape ecology, remote sensing and GIS.

Modelling forest fire risk zone for the management of fire in tropical thorn forest, India

Oral Presentation

Forest fires are the most destructive factors and a real ecological disaster for many tropical forested causing, loss of many endemic and endangered species. We identify factors responsible for forest fire using satellite data (Landsat ETM+ 2006) for Ranthambhore Tiger Reserve (RTR), located in Rajasthan, India. The RTR is one of the important biodiversity hotspot experiencing recurrent forest fires and harboring many endangered faunal species including large predator (i.e. tiger). We used vegetation type, drainage, slope, aspect, elevation, human disturbance as a predictive variables for modelling forest risk zones using MAXENT algorithm. Almost 63% of the study area was predicted to be under very high and high-risk zones. Among the vegetation types, fire prevalence in the dry deciduous forest was higher contributing 85% of the burnt area. The abundance of fires in edge forest in relation to interior forest clearly indicated significant anthropogenic influence empirical factors detected most prone to fire in the region. Our study provides critical spatial information of increased forest fire threat in tropical thorn forest and long term planning for forest fire management is necessary for effective conservation of biodiversity.

Slack, Andrew

Andrew Slack is currently a Master's Candidate at Humboldt State University in Arcata, California. After spending 3 years in the wildland firefighting world Andrew went back to graduate to school to pursue a career in science and forest ecology. When he's not coring trees or sifting through data in R, Andrew spends his time exploring the forests, mountains and deserts of the American West.

The role of growth, defense, and competition on sugar pine mortality in a fire-excluded, old-growth forest of the Sierra Nevada Mountains.

Student Poster Presentation

Large trees are valued for many ecosystem services including carbon sequestration, wildlife habitat, and forest diversity. However, factors such as fire-exclusion, past logging and climate change have reduced old-growth forests in the Sierra Nevada Mountains, and sugar pines (Pinus lambertiana) in particular are under-represented on the landscape. Understanding the relative importance of growth, tree defense (e.g. resin ducts), and competition on sugar pine mortality can provide valuable information for management decisions intended to restore and preserve old-growth sugar pine ecosystems. Using dendrochronology techniques, 33 pairs of live and dead sugar pines were sampled to investigate the influence of growth, defense, and competition on tree mortality. Preliminary results indicated that live trees grew 12% more than dead trees, but the difference was not statistically significant, and total resin duct area was 30% higher in live trees ($p < 0.026$). Interspecific competition was slightly higher for dead trees, but intraspecific competition was 38% lower for dead trees ($p < 0.041$). These results highlight the importance of defense and competition on sugar pine mortality. Management activities that promote sugar pines with greater defense could reduce mortality, but the effect of treatments that reduce competition is less clear.

Smith, Max

Max Smith is a Research Associate with the USDA Forest Service and the Institute of Natural Resources at Portland State University. His publications include papers detailing riparian ecology in New Mexico and a guide to birds of the Pacific Northwest.

Measuring and modeling effects of wildfire on riparian-nesting bird habitat in New Mexico

Oral Presentation

Structure and composition of woody vegetation influence the reproductive success of riparian-obligate birds along aridland streams. Historically, periodic floods shaped these characteristics by controlling survival and reproduction of trees and shrubs. In recent decades, however, wildfire has emerged as the primary disturbance along many streams including the Middle Rio Grande in central New Mexico. Our measurements of post-wildfire vegetation indicate that, along much of the Middle Rio Grande, fire is accelerating a transition from cottonwood (Populus deltoides ssp. wislizenii) gallery forests to woodlands dominated by Russian olive (Elaeagnus angustifolia), saltcedar (Tamarix spp.), and other nonnative species. These woodlands contain fewer nesting opportunities for birds that require large trees and snags. A vulnerability analysis using niche modeling and fire simulation showed that increasing frequency and intensity of fire along the Rio Grande will reduce the amount of suitable habitat for the state-listed Lucy's Warbler (Oreothlypis luciae), the federally threatened western Yellow-Billed Cuckoo (Coccyzus americanus occidentalis) and the federally endangered southwestern Willow Flycatcher (Empidonax traillii extimus). To manage these and other species of concern, riparian habitats that can be preserved and restored must be identified and protected along the Middle Rio Grande and other southwestern streams.

Smith, Gus

Gus Smith recently left Yosemite National Park to take the role as District Ranger on the Kawishiwi Ranger District, Superior National Forest. At Yosemite, Gus worked with academic and federal collaborators on a number of fire ecology and fuels related management questions. Gus is an AFE board member. Gus' interests lie in thinking strategically about where to spend limited fuels funding for protection of private property, natural and cultural resources and other values at risk as well as how to find temporal and spatial low risk landscapes to manage lightning ignitions for resource benefit.

Prioritizing Lightning Ignitions in Yosemite National Park with a Biogeophysical and Socio-Politically Informed Decision Tool

Poster Presentation

In its 2004 Fire Management Plan, Yosemite National Park had identified two management units: Suppression and Fire Use. Park managers have been using a science based approach to prioritize lightning ignitions while identifying risks and wildfire potential. Each year, Yosemite has assessed the current fire situation and addressed whether to manage fires within the Fire Use unit and have developed a decision matrix tool based on biophysical conditions, surrounding fuels, and sociopolitical 'situation awareness. In 2014 and 2015, the park split the Fire Use Unit into two smaller units. Areas above 8,000' where placed into the Manage Unit and areas between the existing Suppression Unit and 8,000' were considered to be in the Conditional Unit. Even in these two drought plagued fire seasons when hundreds of thousands of acres were burning across the Western United States, Yosemite National Park was able to manage lightning ignitions in both the Conditional and Manage Unit. We will present the decision matrix using case studies to validate that there is an appropriate place for managing fires in Yosemite.

Smith, Britt

Britt W Smith is currently a PhD graduate research assistant at Texas Tech University. He is studying the influence of rangeland fire on the arthropod community in the Texas Rolling Plains.

Wildland fire search terms: Trends and patterns

Student Poster Presentation

The use of aggregated data from Internet search terms can be used to study long term trends in interest of wildland fire related issues. We examined Google Trends data from 2004 to 2014 of five wildland fire related search terms. Due to low volume of search results, search terms were geographically restricted to the United States. The five search terms were prescribed fire, prescribed burn, controlled burn, wildfire (restricted to type of fire), and wildland fire. We examined seasonality and trend of each search term. We found a peak in usage of "prescribed fire", "prescribed burn" and "controlled burn" in Spring. We found a peak in summer usage of "wildfire" and "wildland fire". Over time, we found a decrease in the usage of "wildland fire" and "prescribed fire". These results give insight into changes and patterns of common terms used in the wildland fire community. Monitoring these search terms can help evaluate goals and objectives in areas such as educational outreach.

Snitker, Grant

Grant Snitker is a graduate student in archaeology within the School of Human Evolution and Social Change at Arizona State University. Grant currently works on an NSF-funded project examining the role of fire, land-use, and vegetation dynamics in the creation of prehistoric agricultural landscapes in eastern Spain.

Linking the Social and Ecological Dynamics of Anthropogenic Fire Regimes through Agent Based Modeling (ABM) and Geographic Information Systems (GIS)

Oral Presentation

Archaeological and paleoecological analyses demonstrate that human-caused fires have long-term influences on global terrestrial and atmospheric systems. Around the world, prehistoric transitions to agriculture often coincided with increases in fire frequency and changes in vegetation community composition and distribution. Although this phenomenon is commonly identified in paleoecological studies, archaeological research has not fully linked the social and ecological components of anthropogenic fire into discussions of small-scale societies and the origins of agricultural landscapes. Coupled agent based models (ABM) and geographic information systems (GIS) link social and biophysical processes and provide a unique, virtual "laboratory" to test scenarios and outcomes. This paper outlines developing an integrated ABM and GIS laboratory, which includes models of agricultural burning drawn from ethnographic examples and charcoal production and dispersion equations. Long-term dynamics of anthropogenic fire regimes are explored through case studies in the American Southwest and Eastern Spain.

Snyder, Devon

Devon Snyder, Rangeland Ecologist and M.S. Student, University of Nevada, Reno, Devon Snyder is currently seeking a Master of Science degree in Natural Resources and Environmental Science at University of Nevada Reno. Her studies focus on Great Basin rangeland ecology.

Post Wildfire Rangeland Response Under Different Grazing Management Scenarios

Oral Presentation

After fire, the decision to rest or graze a pasture is a difficult one, particularly when managing for a variety of resource conditions and ecological sites. This research project aims to provide ecologically based understanding of the effects of various grazing management schemes on post-fire vegetation communities. Five exclosure plots were established in two different rangeland Disturbance Response Groups (DRGs) in Northern Nevada to examine effects of spring grazing, fall grazing, and rest (control) on vegetative response. Treatments were applied manually using weed eaters in May/June for spring treatments and September/October for fall treatments. In addition, natural grazing in one of the DRGs was studied as cows were allowed back in the allotment 8 months after fire and in subsequent spring seasons. Measurements were taken on vegetation composition, basal gap, annual production, and density of shrub seedlings. Results will show plant community response to different lengths of rest and different seasons of use after fire. Project results will help land managers stratify post-fire management decisions across large landscapes based on pre-fire condition, measured plant community response, and quantified ecological thresholds. Preliminary results from the first three years of data collection will be presented.

Springer, Judith

Judy Springer, Research Specialist, Sr. at the Ecological Restoration Institute at Northern Arizona University in Flagstaff has been studying the effects of fire, tree thinning, and grazing on rare plant species and plant communities in forests of northern Arizona since 1994. She holds an M.S. degree in Forest Science from Northern Arizona University. She is also an editor of the "Field Guide to Forest and Mountain Plants of Northern Arizona," published in 2010.

Smoke-cued Emergence in Plant Species of Ponderosa Pine Forests: Contrasting Greenhouse and Field Results

Oral Presentation

To assess whether aqueous smoke promotes plant emergence in frequent- fire ponderosa pine forests in northern Arizona, we conducted three experiments at different scales (seed, seed bank, and plant community) in both greenhouse and field settings. In the first greenhouse experiment, aqueous smoke significantly in- creased ($P < 0.05$) emergence of seeds of 13 % of 61 assayed species. Five of eight (63 %) Penstemon species exhibited significant increases ranging from two- to ten-fold. In the second greenhouse experiment, aqueous smoke increased emergent density by 67% and species richness by 60 % in soil seed bank samples collected from nine sites that had undergone tree thinning. Contrary to these greenhouse experiments, spraying aqueous smoke on 0.05 ha field plots at nine sites in the third experiment had no effect on plant species cover, richness, or composition relative to control plots 15 months after treatment. Many factors, such as time since fire or interactions with other cues, could have contributed to this lack of response. While aqueous smoke appears promising for some applications, such as enhancing seed germination for plant production, its potential for promoting emergence in field settings is currently uncertain.

Stambaugh, Michael

Michael Stambaugh, Research Assistant Professor, University of Missouri, conducts research related to fire regimes throughout the eastern U.S.

Projected climate change impacts on frequent fire regimes in the southcentral U.S.

Oral Presentation

One of the primary causes for differences in fire frequency among landscapes and regions is climate, specifically climate effects on ignitions, reaction rates, and fuels. The Physical Chemistry Fire Frequency Model (PC2FM) is an empirical model that has been calibrated with historical fire data to estimate coarse scale fire frequency from precipitation and temperature inputs. We projected future changes in fire probability (1/mean fire interval) across the southcentral U.S. by inputting PRISM-based climate data to the PC2FM. Projections of change in fire probabilities were made for the A1B climate scenario utilizing three different Global Climate Models (GCMs) over the periods 1900 to 2050 and 2050 to 2090. Though differences exist due to GCM, from 1900 to 2050 greater increases in fire probability are expected in more eastern that western portions of the region. In mountainous areas, fire probabilities show greatest increases with elevation. For fire and climate, model output suggests that within center of the Great Plains exists a climate-fire frequency tipping point region where, to the east, fire frequency is primarily limited by conditions of the reaction environment (e.g., fuel moisture) and, to the west, fire frequency is primarily limited by reactant (i.e., fuel) production.

Stambaugh, Michael

Michael C Stambaugh, Research Assistant Professor, at the University of Missouri conducts historical fire regime research throughout eastern U.S.

Three hundred years of changes in fire and vegetation at Bastrop State Park, Texas

Poster Presentation

Little quantitative information exists describing fire regimes in the southcentral U.S despite extensive areas of historically fire-maintained communities such as grasslands, woodlands, and pine forests. In 2011, the Bastrop County Complex Fire burned 34,000 acres, including most of Bastrop State Park, in primarily loblolly pine and sand post oak forests. Within the burned area, we located extensive areas of mature, fire-killed relict oak woodlands. We cut cross-sections from the base of 50 dead fire-scarred post oaks within an area of approximately 1 km2. Tree-ring series and fire scar injuries were dated using standard dendrochronological techniques. Fire scar years were compiled to an event chronology from which fire intervals, percentages of trees scarred during fire years, and fire seasonality were determined. Belt transects were used to characterize tree demographics. Three hundred years of fire events are presented. Based on the presence of 300+ yr old trees, the Bastrop Fire severity appears to be unprecedented in the study area during the last 3 centuries or more. Based on stump sprout abundance, blackjack oak will likely be the dominant tree species in the next few decades. Little to no loblolly natural regeneration exists despite being dominant in the pre-fire conditions.

Stanford, Mark

Mark is State Fire Chief and Associate Director of the Texas A&M Forest Service.

Welcoming address on behalf of Texas A&M University Forest Service

Plenary Talk

I will provide a welcoming address to the Fire Congress

Starns, Heath

Heath Starns is a doctoral student at Oklahoma State University. He began his research at OSU in May 2014. Heath's research focuses on how the interaction between prescribed fire and grazing affects prairie-chicken habitat and rangeland wildfire risk. His research includes several vegetation types that are identified as suitable prairie-chicken habitat across four sites in Texas and Oklahoma. Heath is also working on a comparison of field methods and remote sensing for determining Lesser prairie-chicken habitat and rangeland health. He holds a Bachelor's of Science from Texas A&M University and a Master's of Science from Texas State University.

Impacts on prairie-chicken habitat from management of rangeland fuels

Oral Presentation

Long-term changes to historic fire regimes have resulted in encroachment of woody plants into prairies of the Great Plains. An additional consequence of fire suppression is the increased occurrence of severe wildfires associated with excessive fuel buildup. In efforts to return to more historic fire regimes, prescribed fire is becoming a favored management practice among some stakeholders. When fire is applied in a patchwork manner across the landscape and paired with grazing (patch-burning), the result is heterogeneity of vegetation structure and composition, which has fuels implications. Our study compares the effects of the fire-grazing interaction to fire alone on fuel properties and prairie-chicken habitat. Four vegetation types are represented by sites across Texas and Oklahoma: tallgrass prairie, shinnery oak, sand-sagebrush, and gulf coastal prairie. Three sites incorporate patch-burning into their management strategy, while the fourth uses fire alone. Un-grazed areas are available at each site for comparison to patch-burning treatments. By sampling areas with different times since fire, we can assess how the fire-grazing interaction affects fuel characteristics and parameters of prairie-chicken habitat. Preliminary analysis suggests that patch-burn grazing allows for conservation of prairie chickens, while simultaneously maintaining lower fuel levels for an extended time compared to burning alone.

Flammability Characteristics of Select Native Prairie Species

Poster Presentation

Flammability characteristics of fuels are of great importance to fire managers. Fire modelling software programs require users to specify the most appropriate site-specific fuel model based on broad-scale vegetation type and structure. Thus, models representative of grasslands are divided based on regional differences (i.e. tall/short grass, humid/arid climate). Fire managers in grassland regions are generally aware that different species of grasses behave differently during a fire. Our objective was to quantify differences in flammability characteristics among native grass and forb species capable of dominating large areas, potentially affecting fire behavior. In order to measure these differences, plants were clipped and dried, then burned in a standard lab vent hood. We measured fuelbed depth, average particle size, percent fuel burned, maximum temperature, maximum flame height, average flame height, flame time, total burn time, and ember time. Our results suggest that these prairie species differ from one another in flammability characteristics. Such information may allow fire managers to better prepare for prescribed burns, as well as in the planning of suppression tactics on wildland fires.

Steffen, Anastasia

Anastasia Steffen is the Cultural Resources Coordinator at the Valles Caldera National Preserve in northern New Mexico USA. She is on the Climate Change Strategy Task Force for the Society for American Archaeology and has been involved with archaeological fire effects research and management since 1996. She is a co-PI on the JFSP-funded ArcBurn project (http://www.forestguild.org/Arcburn).

ArcBurn: Measuring and Managing Fire Vulnerability of Southwestern Cultural Landscapes

Oral Presentation

How can the archaeological record be used as a chronicle of prehistoric forest fires? How do cultural resources managers today evaluate the potential impacts of wildland fires? The ArcBurn project, funded by the Joint Fire Science Program, is a collaboration among archaeologists, fire scientists, forest ecologists, and fire managers. This project was created to develop hard data on fire effects to ensure that the best science is effectively and appropriately used to guide management plans, and that these plans are defensible and reasonable under dynamic environmental conditions. We are using laboratory and field experimentation to quantify the fire dose that causes unwanted damage to three kinds of artifacts: pottery, obsidian, and architectural stones. We also measure indirect fire effects by assessing post-fire erosion. The context for this work is the Jemez Mountains of northern New Mexico, USA, a fire-prone landscape where wildfires in the last three decades have dramatically increased in size and severity, resulting in profound impacts to this rich and previously stable archaeological record. We review the goals for this project, provide our preliminary results, and discuss the increasing relevance of archaeological perspectives in comprehending and responding to climate change.

Steffey, Eric

Eric C. Steffey Graduate Student Arizona State University Eric Steffey is a fourth year Ph.D. student at Arizona State University in the School of Community Resources and Development. He has a Bachelor and Master degree from Michigan State University where he studied natural, cultural, and recreation resource management. Eric has field experiences working at Sleeping Bear Dunes National Lakeshore and the Florida Park Service. While employed by the Florida Park Service Eric was an active Wildland Firefighter participating in numerous Rx burns, wildfires, education programs, and outreach. Eric's experience with wildland fire continues to spur interests in his graduate research which is focused on Homeowner mitigation behaviors.

Developing an Integrated Behavioral Model to Understanding Homeowner Mitigation

Oral Presentation

With the increasing wildfire risk to life and property in the Wildland Urban Interface (WUI), mitigation actions by homeowners are paramount in risk reduction. However, many do not always perform these actions for a variety of reasons. Understanding reasons why homeowners may or may not mitigate their property is critical for developing policy and focusing limited resources to gain more comprehensive community compliance. Currently, much of the literature on homeowner wildfire mitigation behaviors is location specific or examines only a limited set of behavioral factors. This paper proposes a predictive model based on the Theory of Planned Behavior (TPB) that incorporates numerous salient factors identified in the wildfire mitigation literature. TPB suggest attitudes, subjective norms, and perceived behavioral controls explain a person's intention to perform the behavior being studied. By including relevant wildfire mitigation factors to TPB, like wildfire knowledge and experience, perceptions of risk, and locus of responsibility, a better understanding of the dynamics involved in homeowner mitigation can be identified. In addition, this model is intended to provide a measurement tool that can be applied in different and diverse communities to understand the specific local dynamics.

Steinkamp, Lauren

Lauren Steinkamp is a undergraduate student at the University of Wisconsin Stevens Point. She is studying Ecosystem Restoration and Management. This summer she researched the effects of fire on vegetation in Northern Wisconsin.

Fire Effects on Great Lakes Vegetation

Student Poster Presentation

The purpose of this study was to examine patterns of species richness, relative abundance, and percent cover of the understory plant community in Red Pine and Mixed Pine-Hardwood stands of Northern Wisconsin. Baseline data was collected in the summer of 2013. Eight combinations of thinning and fire frequency were applied in a completely randomized design across 24 two acre experimental units. Quadrat sampling was used in twelve plots within each of the twenty-four units. We calculated species density, frequency, percent cover, richness, diversity, evenness, and Bray-Curtis dissimilarity index for herbaceous species. We tested for treatment differences using the Kruskall-Wallis test with mean separation by Tukey's test. We also used regression techniques to examine the relationship of individual species with over story canopy cover, fire frequency and other environmental variables. We found that species richness is most influenced by stand density, available percentage of ground cover, and composition of woody species. We also found that the treatment of thinning and fire decreased percent cover of woody vegetation and increased sprouting of woody vegetation. The percent cover of grasses significantly increased by thinning and two years of annual fires.

Stephens, Scott

Scott is a Professor of Fire Science and Chair of the Ecosystem Sciences Division at UC Berkeley. He is also the director of the UC Center for Fire Research and Outreach, co-director of the UC Center for Forestry, and is the leader of California Fire Science Consortium. Stephens' areas of expertise focus on interactions of wildland fire and ecosystems. This includes how prehistoric fires once interacted with ecosystems, how current wildland fires are affecting ecosystems, and how climate change and management may change this interaction. He is also interested in wildland fire policy and how it can be improved to meet the challenges of the next decades.

Fire ecology and management in the western US: Challenges but with great possibilities

Plenary Talk

Early work in the western US demonstrated the beneficial effects of 'light burning' and wilderness fire management but these ideas were eventually overridden by a full fire exclusion policy. Many forests have therefore been altered by 100 years of fire suppression and past harvesting which has increased their hazards and susceptibility to fires with intensities and severities outside of desired ranges. Changing climates have intensified these problems but all is not lost. When discussing current fire impacts it is critical to anchor them to specific fire regimes. Crown-fire-adapted ecosystems are likely at higher risk to climate changed influenced fire regimes as compared with other ecosystems once subject to frequent less severe fires. We know how to restore frequent fire adapted forests, with generally positive or neutral ecological effects. Today's challenge is to move more quickly to restore large areas of these ecosystems. The next 2-3 decades are absolutely critical in terms of restoration. If we are unable to restore frequent fire adapted ecosystems wildfire will change these landscapes with outcomes that are not desirable. In 50 years when our grandkids are having families I hope that they will be able to enjoy these forests and their associate ecosystem services similarly to what we have experienced. This is possible.

Stevens, Jens

Jens Stevens is a plant ecologist interested in the effects of disturbance and climate on plant diversity and demography. Much of his research focuses on forests of western North America, investigating patterns of understory diversity in response to fire and forest management. He is currently a post-doc with the UC Davis John Muir Institute of the Environment, after finishing his PhD in 2014 at the UC Davis Graduate Group in Ecology.

Multi-scale effects of fire severity on snowpack dynamics in montane coniferous forests

Oral Presentation

Temperate montane forests contribute disproportionately to water supply in the arid landscapes of western North America. Fire severity is likely to have strong effects on snow accumulation and ablation (melt) rates by changing canopy interception and landscape albedo. I tested how fire severity and forest canopy cover influence snowpack depth at multiple scales, using 2047 gridded snow depth measurements from 11 total visits to 3 different fires in the Sierra Nevada of California. Ablation effects of canopy disturbance dominated snow depth patterns: increasing fire severity had a strong negative effect on snowpack depth. The unburned forest condition had the highest overall snowpack depth, and mean snow depth among all site-visits was reduced by 78% from unburned forest to high-severity fire. However, at the individual tree scale, measurements underneath canopy had significantly less snow than measurements in gaps, controlling for effects of fire severity. This apparent paradox in snowpack response to fire at the individual tree vs. landscape scales is due to greater variation in canopy cover in unburned and very low severity areas, which creates small areas for snow accumulation while reducing ablation. Efforts to maximize snowpack duration in montane forests should focus on retaining fine-scale heterogeneity in forest structure.

Stevens-Rumann, Camille

Camille Stevens-Rumann is a forest disturbance ecologist who studies the interactions between repeated disturbances. She currently holds a split position as a post-doc at the Unviersity of Idaho and an Adjunct faculty member at Cal Poly.

The evaluation of burn mosaics on subsequent wildfire burn severity and post-fire effects

Oral Presentation

This study examined how previous burn severity, topography, vegetation, and weather influenced burn severity. Further, we examined post-disturbance successional patterns and forest structure in areas of repeated wildfires. We examined four wildfires, using a spatial autoregression to test the influence of burn severity, topography, vegetation, and weather on subsequent burn severity. We also tested the hypothesis that the number of wildfires, as well as the order and severity of wildfire events interact to alter forest structure and vegetation recovery. Three important findings emerged: (1) areas previously burned in the last 23 years, at any severity, had lower burn severity in the subsequent fire. Topography, vegetation, and weather also influenced burn severity. (2) Repeatedly burned forests had 15% less woody surface fuels and 31% lower tree seedling densities compared with forests that only experienced one recent wildfire. (3) When low burn severity followed high, forests had 60% lower canopy closure and total basal areas with 92% fewer tree seedlings than when high burn severity followed low. Our findings show that reburning within a short time period reduces the proportion of high burn severity and repeatedly burned areas meet many vegetation management objectives of reduced fuel loads and moderate seedling densities.

Stockdale, Christopher

Chris Stockdale is a PhD Candidate at the University of Alberta. During his studies he has developed new methods for the analysis of historical photography which has been published in the Journal of Applied Geography. Prior to beginning his PhD studies he was the provincial coordinator of Alberta's prescribed fire program.

Modeled changes in burn probability in a Canadian Rocky Mountain landscape restored to pre-European Settlement conditions

Oral Presentation

Across western North America, grasslands and open canopy forests have been lost to encroachment and densification of forests as a result of fire exclusion policies. We used historical photos from c. 1900 to reconstruct what the vegetation on the landscape was at the time of European settlement. Focusing on the Bob Creek Wildland region of southern Alberta, the objective of this study was to measure how much the fuel complex has changed, and how this altered fuel complex affects burn probability, rate of spread and headfire intensity. Burn probability is defined by the number of times a given unit (cell) on the landscape will burn under fixed conditions. Initial results reveal that between 1900-2010, grass and deciduous fuels have declined in abundance, and coniferous fuels have largely replaced them. This change is most apparent on south and west facing aspects and in the low elevation valleys. Early Burn P-3 modelling runs reveal significant changes in fire behavior over this time period. Alberta Agriculture and Forestry has numerous prescribed and wildfire management plans, forest harvesting plans, and fuel treatment plans for the region. These results will provide management with quantitative measures and targets that they can use for managing vegetation to mitigate fire risk on a landscape scale.

Extracting ecological information from oblique angle terrestrial landscape photographs: Performance evaluation of the WSL Monoplotting Tool

Student Poster Presentation

Aerial photography and satellite imagery are the usual data sources used in remote sensing, however land based oblique photographs can also be used to measure ecological change. Using historical photographs, the time frame for change detection can be extended into the early 1900s. The WSL Monoplotting Tool is software for analyzing such photographs. Users can extract spatially referenced vector data from oblique photographs.The Mountain Legacy Project, contains >6,000 high resolution oblique image pairs showing landscape changes in the Rocky Mountains of Alberta between ca. 1900 – today. We used photographs from this collection to assess the accuracy and utility of the WSL Monoplotting Tool for georeferencing oblique photographs and measuring landscape change. We determined that the tool georeferenced objects to within less than 15m of their real world 3D spatial location, and the displacement of the geographic center of over 121 control points was less than 3m from the real world spatial location. We further demonstrate a method by which raster data can be rapidly extracted from an image pair to measure changes in vegetation cover over time. This new process permits the rapid evaluation of a large number of images to facilitate landscape scale analysis of oblique imagery.

Stonum, Scott

Scott Stonum, Chief Science and Resource Management, NPS Saguaro National Park. Scott has worked for the NPS for 28 years and has been associated with fire management at 6 National Park sites and has held the position of Wildlife Specialist on an Inter-agency Burned Area Emergency Rehabilitaion Team for the Pacific NW and SW. He received the NPS Directors Award for Resource Management in 2007. Scott was in a detail as Superintendent of Saguaro National Park last summer and therefore, as the Line Officer during the time-frame of the fires being discussed.

Case Study: Deerhead and Jackalope Fires, Saguaro National Park

Oral Presentation

Identifying and managing potential challenges associated with the perception of fire is critical for being able to successfully implement an ecologically derived fire management plan that includes allowing fire to function naturally on the landscape. During the summer of 2014, two fires within the Rincon Wilderness unit of Saguaro National Park triggered two very different responses. This presentation will discuss the pre-planning and situational considerations that led to managing one fire for resource benefit while moving quickly to contain a second fire, both on the same mountain. Discussion topics will include ecological considerations for establishing different fire management zones within the park, challenges to managing fires for resource benefit, community dynamics, and invasive plant management linked to fire management.

Sturdevant, Jay

Jay Sturdevant is an Archeologist at the National Park Service's Midwest Archeological Center in Lincoln, Nebraska. He was co-principle investigator on a region-wide study of wildland fire effects to archeological resources in the Midwest. He routinely advises National Park units on the preservation of archeological sites with fire sensitive materials.

Historic Archeology, Climate Change, and Wildland Fire: A Midwestern Perspective on Future Threats to Resource Preservation.

Oral Presentation

Environmental change brought about by shifting climates has the potential to drastically influence archeological resource preservation throughout the world. In this context, the preservation of archeological resources depends upon our ability to adaptively manage threats for multiple resource types and preservation scenarios. Wildland fires have the potential to threaten many archeological sites in the Midwest Region. The threat to historic archeological sites is particularly acute in this regard. Studies throughout the Midwest Region have identified archeological sites dating to the last 200 years as the most vulnerable to significant damage from wildland fire. Projections for the Midwest region show increasing wildland fire frequency and intensities and infer a growing threat to the preservation of historic archeological sites. How will the greater variability and uncertainty of our changing world affect efforts to protect these sites? This presentation will provide an overview of the experimental program used to identify fire threatened sites in the Midwest, discuss the potential for increased impacts to archeological resources from wildland fire, and propose strategies to protect sites through management actions.

Sullivan, Alan

Alan P Sullivan, Professor of Anthropology, University of Cincinnati. Recent publication: "The Archaeology of Ruderal Agriculture." In Traditional Arid Lands Agriculture: Understanding the Past for the Future, edited by Scott E. Ingram and Robert C. Hunt, pp. 273-305. University of Arizona Press, Tucson. 2015. Bio: With survey and excavation data from his long-term archaeological project in the Upper Basin, which is located just south of Grand Canyon National Park in northern Arizona, Dr. Sullivan is investigating how the ecological dynamics that arise from environmental manipulation by anthropogenic fire, intensive wild-plant production, and unintensive horticulture affect the distribution of perennial settlements and the abandonment patterns of landscapes. He is interested, as well, in applications of high-resolution satellite remote-sensing in heritage-resource research and management.

Anthropogenic Fire Ecology and Food-Supply Security: Lessons from Archaeology

Oral Presentation

Archaeological investigations of the effects of anthropogenic fire on the livelihoods of small-scale societies, particularly those of the prehispanic northern Southwest, are embryonic in scope and disciplinary impact. When burning has been mentioned in studies of the subsistence economies of small-scale societies, its role is confined to considerations of its effectiveness in clearing or deforesting areas for corn agriculture or to modeling the degree to which agricultural productivity was enabled or constrained by fire-climate variability. Only rarely has fire-management itself been regarded as a technology that could be deployed to transform ecosystem "services" and to stabilize food-supply systems. In this contribution, I integrate recent findings from archaeological and modern fire-ecological studies to illustrate the economic role of anthropogenic fire in small-scale societies. With data from the Grand Canyon area of northern Arizona, I propose that fuel-load management by low-intensity understory burning was a sustainable and ecologically-sound practice that not only increased food-supply security but shielded economically-autonomous populations from long-term climatic variability and short-term environmental uncertainty. I conclude with some arguments about the indispensability of archaeological research in contextualizing decision-making regarding the management and restoration of today's fire-adapted woodland ecosystems.

Swaney, Nikole

Nikole Swaney is the Allegheny Highlands Restoration Coordinator for the Virginia Chapter of The Nature Conservancy. Mrs. Swaney has worked for The Nature Conservancy for eight years. She is a Co-Lead for the Fire Learning Network Fire Effects Monitoring Working Group and works closely with partners from the George Washington & Jefferson National Forest, Virginia Department of Game and Inland Fisheries and The Virginia Department of Recreaction and Conservation.

Using Adaptive Management to Guide Prescribed Burn Programs in the Central Appalachian Mountains.

Oral Presentation

Using Adaptive Management to Guide Prescribed Burn Programs in the Central Appalachian Mountains. In 2009, Fire Learning Network partners in the Central Appalachians initiated a monitoring program to utilize adaptive management methods to guide their prescribed burn programs. The cycle of adaptive management involves researching the ecosystem(s) where burning is conducted, developing measurable objectives for burn plans, planning and conducting monitoring based on burn objectives, implementing management actions, conducting monitoring before and after burns, and analyzing the results. Results from 150 macro plots [one] year after burning indicate significant reductions in woody stem densities for <10 cm diameter at breast height (DBH) size classes, modest reductions in canopy cover, and variable shifts in understory species composition. Results from this monitoring program are consistent with research on controlled burns elsewhere in the Appalachians. These results are used to evaluate burn frequencies and firing techniques, and track progress towards collaboratively-developed management objectives and desired conditions for the project area. Adaptive management is an ever-evolving process that will continue through monitoring and a dynamic burn program and can provide the scientific backing behind management actions on the landscape.

Women in Fire Training Exchange

Poster Presentation

Women in Fire Training Exchange, Fall 2016 According to the USDA Forest Service, only 10% of wildland firefighters are women, and only 5% are operational. As a consequence of these limited numbers, only 7 in 100 supervisory positions in wildland fire are filled by women leaders. The chance you will work for a woman Division Supervisor is 1 in 30. In response to these inadequate numbers, Ms. Bequi Livingston of the Forest Service‘s Regional Office in Albuquerque developed the "Women in Fire Boot camp" to increase the number of women working in wildfire. With this recruitment initiative being handled, there is now a recognized need to develop a program that bolsters and invests in women's leadership in the fields of wildland fire, natural resource management, and conservation. The Fire Learning Network (FLN), a joint project of The Nature Conservancy, USDA, and Department of Interior agencies, supports experiential training through prescribed fire training exchanges (TREX); since 2008, 40 training exchanges have provided 1,300 training opportunities and treated more than 75,000 acres with ecological fire across the US and internationally. While attending NCTREX in spring 2015, women fire practitioners began exploring the idea of utilizing a prescribed fire training event as a venue to develop operational and leadership skills of women in fire. A women's TREX (WTREX) will offer a rare opportunity to bring together a wide range of experienced female fire practitioners for two weeks of hands-on prescribed fire implementation, leadership training, and shared learning. The training will build capacity on multiple levels. TREX supports local efforts to implement prescribed fire and improves practitioner preparation to meet the challenges of a complex fire environment, all while improving forest health, enhancing wildlife habitat, and protecting communities and watersheds. WTREX will build new regional and national networks of fire practitioners, enabling further collaborative efforts. WTREX will also provide participants with opportunities to build fire qualifications, establish new personal and working relationships with other women in fire, and identify and pursue leadership and other critical positions in the wildland fire service. Vision Statement: The Women's Training Exchange (WTREX) is a two-week prescribed fire training event that will support women fire practitioners in boldly working toward leadership roles. During this event, women will be challenged to display courage, tenacity, integrity, and resilience while functioning proficiently in a variety of roles. The WTREX strives to conquer challenges that women face in the world of wildland firefighting, natural resources management, and conservation. Mission Statement: WTREX empowers women wildland firefighters to be bold leaders by providing a training environment that supports leadership development and relationship building in addition to experience in prescribed fire practices.

Taber, Mary

Mary Taber is a Fire Ecologist-Training Specialist who works remotely for the University of Idaho as part of the WFM RD&A Fuels and Fire Ecology program. She was the lead author of "Decision making for wildfires: A guide for applying a risk management process at the incident level" (RMRS-GTR-298, 2012). She is also a Long Term Fire Analyst (LTAN) on the last remaining Wildland FIre Management Team in the U.S.

"Fire Use:" It's All About the Objectives

Oral Presentation

Contrary to popular belief, "Fire Use" remains a legitimate term in fire management—it just needs to be applied correctly. Instead of describing a type of wildfire incident ("Fire Use Fire"), a position ("Fire Use Manager") or a resource ("Fire Use Module"), its definition has narrowed—its NWCG-approved definition refers to the act of "managing fire to meet resource objectives specified in Land/Resource Management Plans." Resource objectives form the basis of the definition and the action: Without specific, measurable resource objectives that describe where wildfire will be used to protect, maintain, and enhance resources consistent with management objectives, it's not fire use—it's just "letting it burn."

Talucci, Anna

Anna is a PhD student at Simon Fraser University in the Department of Geography working with the Landscape and Conservation Science Research Group, where she studies forest ecosystem response to wildfire. Preliminary research has focused on landscape scale fire disturbance in central interior British Columbia, Canada, where she is excited to integrate fieldwork and remote sensing. In her free time, Anna can be found in the mountains often sharing her love for the outdoors and wild places with students.

Conceptualization of early successional pathways after wildfire in lodgepole pine dominated forests with high mortality from mountain pine beetle

Student Poster Presentation

Early successional pathways of lodgepole pine (Pinus contorta var. latifolia) plant communities vary in conjunction with species ecology, biological legacies, and wildfire effects, and may be affected by pre-fire tree mortality from mountain pine beetle (Dendroctonus ponderosae; MPB). In central interior British Columbia, Canada, the MPB outbreak peaked in 2002 killing large numbers of lodgepole pine. The 2014 Chelaslie Fire burned an area dominated by lodgepole pine in late gray-stage MPB with pre-fire pine mortality of 70-100 percent. Previous studies of MPB and fire suggest that burn severity and post-fire seedling density are not strongly affected by the severity of MPB outbreak, but the forests studied contained relatively low proportions of lodgepole pine and/or low-to-moderate proportions of pine mortality from MPB. Here, we use data from pilot fieldwork in the Chelaslie burn to characterize initial post-fire species composition and conceptualize early successional pathways for lodgepole pine dominated forest ecosystems that experienced high mortality from MPB 12-years prior to wildfire occurrence. We consider effects of late gray-stage MPB structure including a shift in lodgepole pine cones from canopy to ground, burn severity, and proximity to the unburned to explore potential trajectories in re-establishment.

Taylor, Alan

Alan Taylor is a Professor of Geography and his research focuses on the effects and interactions of fire disturbance, climate, and people on forest dynamics. He has done fire related research in the montane forests of the Pacific Northwest, California and the American Southwest. Alan has served as an Associate Editor for the Canadian Journal of Forest Research and been on the editorial board of Geography Compass and Physical Geography. He teaches undergraduate and graduate courses on landscape ecology, global ecology and biogeography, forest geography, vegetation dynamics, and invasive species, and fire, ecosystems, and people

The influence of topography, weather, fuels, and management on fire severity in overlapping wildfires in the Sierra Nevada

Oral Presentation

The number of large, high-severity fires has increased in the Sierra Nevada mixed conifer forests during the past thirty years. The major reason for the increase in area burned and area burned at high severity in recent decades is mainly related to an increase in fuels caused by fire suppression and climate warming has also contributed. Here, we use Random Forest and CART models to identify the influence of terrain, weather, fuels and management in two large fires that also overlapped. For the Storrie fire, day of burn, elevation, and landscape management unit were the most important predictors of fire severity followed by percent tree canopy cover. The most important predictor variables for the Chips fire were similar except firing operation was most important and weather had little influence. In the area of overlap, burn severity of the first fire was the most important predictor followed by relative humidity, landscape management unit and elevation. These results suggest that uncharacteristically severe fires could shift fire-vegetation relationships over wide areas by initiating self-reinforcing fire effects when areas burn again.

Land-use change triggers fire regime shifts and modulates Sierra Nevada fire-climate interactions since 1600 CE

Oral Presentation

Fire has been a key regulator of ecosystem structure, composition, and function in Sierra Nevada mixed conifer forests and their fire regimes have changed over time. For example, burning rates have increased since the mid-1980s because of regional warming and fire severity has increased because of an increase in fuels caused by fire suppression. This suggests that mixed conifer forests are particularly sensitive to changes in climate and land use. Yet, records of fire, climate and land use changes over the observational period (post 1908) are too limited to evaluate the effects and interactions of climate and land use change on fire regime. Here, we use ecological regime shift analysis with a >400 year record of fire extent for the Sierra Nevada that spans > 400 years to test the hypothesis that shifts in SN fire regimes over the last four centuries have been triggered by climate variation and land use change. Area burned was influenced by drought and temperature for the entire record. However, shifts in area burned were associated with land use changes associated with Native American depopulation, expansion of Euro-American land use during the gold rush, and implementation of federal fire suppression policy.

Terrier, Aurélie

Aurélie Terrier is a postdoctoral researcher at the University Laval in Québec (Canada). Her research examines the relationships between climate, fire and vegetation in the boreal forest in eastern North America. She's focused on research questions related to forest management to reduce wildfire increase in response to climate change. Currently, she's also interested on the impact of climate change on carbon stocks.

Paludification mediate the ecological impact of an intensifying wildfire regime in the Clay Belt boreal forest of eastern North America.

Oral Presentation

High moisture levels and low occurrences of wildfires have contributed during recent millennia to the accumulation of thick soil organic layers and to a succession into open black spruce - Sphagnum dominated forests in the Clay Belt boreal landscapes of eastern North America. In these forests, the anticipated increase in drought frequency with climate change could lead to a shift in forest landcapes and to a subsequent transfer of the stored carbon back into the atmosphere via increased fire disturbance. Herein, we conducted modeling experiments using the Canadian Fire Effects Model (CanFIRE) to investigate potential changes in forest structure and composition in response to a changing fire regime. Results from multiple scenarios suggested that fire danger will rise significantly during the 21st century in the Clay Belt forest. A shift in forest composition did however not occur over the simulation period across most of our fire regime scenarios. Moist and cool conditions in these forests prevent high depth of burn and contribute to the ecological resistance of these forests to increasing fire danger.

Thode, Andrea

Andi received her BS in environmental biology and management and PhD in fire ecology from the University of California Davis. She is currently Associate Professor in the School of Forestry at Northern Arizona University and Principal Investigator for the Southwest Fire Science Consortium.

The Southwest fire community: Developing relationships and products to meet diverse needs

Oral Presentation

The Southwest Fire Science Consortium (SWFSC) has been tasked with disseminating fire science and building relationships within the Southwestern fire community since 2009. We have hosted several workshops and conferences featuring interactive roundtable discussion sessions with great success. Bringing together varied stakeholders such as managers, practitioners and scientists and shaking up disciplines and backgrounds provides many different perspectives within any one discussion. This technique tends to encourage careful consideration of diverse viewpoints and novel ideas, and promotes active participation. Initially, the SWFSC targeted only the professional fire community, but we have recently begun targeting the public with our largest event to date, a science and art collaborative culminating with a nearly two month long art exhibit that featured science interpretation and knowledgeable presenters during special events. We have also convened a group of public communication and education experts to determine how best to assist in communicating current fire science to the public as well as inserting it into conservation education curriculum.

Tiller, Michael

Michael B. Tiller currently works for the Texas A&M Forest Service as a Wildland Urban Interface Specialist. He is also a graduate student at Stephen F. Austin State University seeking a Ph. D. in Forestry.

EFFECTS OF YAUPON, CHINESE PRIVET, AND CHINESE TALLOW ON UNDERSTORY FUEL FLAMMABILITY IN EAST TEXAS HARDWOOD AND PINE ECOSYSTEMS

Oral Presentation

Accurate fire behavior prediction in understory fuels is an essential component for estimating fire intensity and severity during wildfires and prescribed fires. This study focused on estimating temporal and seasonal changes in fuel loading and flammability parameters associated with invasive yaupon (Ilex vomitoria), Chinese privet (Ligustrum sinense), and Chinese tallow (Triadica sebifera) in East Texas pine and hardwood ecosystems. Fuel loading data of invasive species infested sites indicated substantial increases in understory biomass when compared to1988 estimates. Oxygen bomb calorimetry (OBC) and thermogravimetric analysis (TGA) were used to identify potential seasonal variations in flammability. OBC and TGA proximate analysis indicated significant seasonal differences in mean net heat content (NHC), ash %, and volatile matter % in Chinese privet and tallow. Yaupon and Chinese privet exhibited the highest mean NHC values in both seasons. Comparison of thermokinetic analyses using mean activation energy (Ea), relative spontaneous ignition temperature (RSIT), and gas-phase combustion rate revealed flammability differences among all species during growing and dormant seasons. Ea and RSIT results indicated that yaupon foliage and Chinese tallow wood were the most ignitable and combustible fuels in both seasons.

Tinkham, Wade

Wade Tinkham is a Postdoctoral Fellow at Colorado State University working on forest biometry questions related to fuel and forest heterogeneity. He brings a combination of sampling, modeling, and remote sensing expertise to the changes of quantifying the heterogeneous nature of restored dry western forest systems.

Treatment Longevity of Ponderosa Pine Forest Restoration: Implications of Regeneration on Fire Hazard

Oral Presentation

Restoration of ponderosa pine forests in the central/southern Rocky Mountains for ecological and fuel hazard reduction purposes has grown in emphases over the last decade. During this time new management practices embracing ideas of a highly heterogeneous uneven-aged forest structure consisting of a mixture of different aged tree groups, scattered individual trees, and openings has been adopted. However, the heterogeneous nature of the stand structure left after these thinnings creates opportunities for natural regeneration to successfully establish at unusually high levels (> 1,000 ha-1) in the absence of fire. This study assesses the effects of regeneration timing and magnitude on ponderosa pine restoration thinning longevity utilizing a coupled Forest Vegetation Simulator and Crown Fire Initiation and Spread (CFIS) modeling framework. Treatment longevity was assessed as the time required for the stand to return to within 10% of its' pre-treatment torching and crowning indices as calculated by CFIS. Results show that 40-50 and 50-85 years after regeneration is introduced the stands return to pre-treatment torching and crowning indices respectively. This temporal lag reduces by 10 years for every 830 and 475 seedlings per hectare introduced to the torching and crowning scenarios respectively.

Toomey, Adam

Adam is doctoral student at Texas A&M University - Kingsville studying the effects of season of prescribed burning on Gulf cordgrass communities.

Season of Prescribed Burning on Kleberg Bluestem (Dichanthium annulatum) in South Texas

Oral Presentation

Kleberg Bluestem (Dichanthium annulatum), a warm-season perennial bunchgrass that is native to both the Asian and African continents, was introduced to South Texas during the 1930s. Kleberg bluestem's introduction has greatly impacted native plant communities and the wildlife that inhabit them. I conducted a season of burning study to evaluate the use of prescribed burning as a control method for Kleberg bluestem. I investigated effects of both summer and winter burning on individual- as well as community-level metrics to better understand the initial impact of the fire treatments. Results indicate that summer burning can produce higher mortality rates in Kleberg bluestem than both winter burning and control treatments. However, both burning treatments increased seedling recruitment over control treatments. Furthermore, burning in either summer or winter did not affect individual plant production. These results suggest neither summer nor winter burning is effective for control of Kleberg bluestem as a single treatment, although summer burning is a better choice than winter burning.

Tripp, Winston

Winston Tripp spent ten years as a wildland firefighter for the U.S. Forest Service and Bureau of Land Management. After receiving his B.S in Sociology from the University of Oregon he earned his M.A., and Ph.D. in Sociology from the Pennsylvania State University. He now researches and teaches environmental sociology at the University of West Georgia.

Social Factors Affecting Media Analyses of Wildland Fires

Oral Presentation

Social scientists have in recent years begun examining media portrayals of wildland fires. In this research, we examine this issue more closely to focus on the variations of the narratives used in news articles that emerge throughout the life cycle of the wildland fire. To examine this question we randomly selected 47 newspaper articles between 2000 and 2010 related to Class G fires throughout the contiguous United States. We then conducted content analysis on the articles to identify different narratives in the ways in which the articles reported information about the wildland fires. We find that three distinct themes emerged from the analysis. Early in the life cycle of a large wildland fire, most newspaper articles focus on fire as a natural disaster. Next, as a fire progresses, most reports focus more on the economic and physical costs of the fire. Finally, although only a few articles focus on fires outside of the fire season, those that do tend to be focused on fire rehabilitation and recovery, and often emphasize the role of fire as a component of a healthy ecosystem. These findings have important implications for those tasked with educating the public on fire ecology and fire use.

Trouvé, Arnaud

Arnaud Trouvé is Professor in the Department of Fire Protection Engineering at the University of Maryland, College Park. He joined the Faculty in 2001 with a Ph.D. (1989) and Engineering Degree (1985) from École Centrale of Paris, France, and with previous experience as a combustion research engineer. He is on the editorial boards of 5 combustion science and fire science journals. He is also Vice-Chairman of the International Association for Fire Safety Science (IAFSS) and Chair-Elect of the US Eastern States Section of the Combustion Institute (ESSCI). Professor Trouvé's research interests include fire modeling and Computational Fluid Dynamics.

Numerical Simulations of the Structure of Wildland Fire Flames

Oral Presentation

The objectives of the present study are to perform detailed large eddy simulations (LES) to provide a basic understanding of the structure and dynamics of wildland fire flames, to evaluate the relative weight of external/wind-driven versus internal/buoyancy-driven motions, and to provide a companion computational component to the experimental component of the University of Maryland wildland fire research program. Numerical simulations are being performed with an advanced Computational Fluid Dynamics (CFD) capability, developed by FM Global, and called FireFOAM (https://github.com/fireFoam-dev). FireFOAM is based on a free, open-source, general-purpose, CFD software package called OpenFOAM (http://www.openfoam.com), and features state-of-the-art computational mesh generation and physical modeling capabilities. The present study considers two simplified configurations: a classical thermal boundary layer configuration in which an external flow is established over a horizontally-oriented heated plate; and a boundary layer flame configuration in which an external air flow is established over a floor-mounted gas burner. Simulations are performed with fine-grained computational mesh resolution (LES are wall-resolved) and therefore provide both a detailed description of the flow/temperature fields and a direct evaluation of the wall convective heat flux. In both configurations, the simulated flow features buoyancy-driven organized vortical structures that are analyzed as manifestations of Rayleigh-Taylor instabilities.

Tubbesing, Carmen

Carmen Tubbesing is a doctoral student at UC Berkeley advised by Scott Stephens and John Battles in the department of Environmental Science, Policy, and Management.

Linking pre- and post-thinning stand structure with post-fire recovery: mortality and seedling regeneration in the American Fire footprint

Poster Presentation

Amidst an increase in severe wildfires in the Sierra Nevada, land managers are likely to expand their use of fuels reduction treatments. While fuels treatments can help limit fire severity, their effects on post-fire forest dynamics have only recently begun to receive research attention. This study capitalizes on the overlap between a long-term fuels treatment study and a natural wildfire that burned in the Tahoe National Forest in 2013. Our objective is to determine whether areas thinned <5 years before fire experienced lower tree mortality, greater regeneration, and/or differing seedling composition compared to untreated plots. Before and after treatment, but before the fire, we tagged overstory trees and recorded shrub, litter, and canopy cover in 354 plots sized 500 m2. In 2014, 170 burned plots were revisited to repeat these measurements and record tree mortality. In 2015, we measured mortality and seedling density by species for 105 burned and unburned plots, 31 of which had been treated. We are evaluating how post-fire tree mortality and seedling regeneration vary with treatment history, fire severity, density of parent trees, and pre- and post-fire shrub, litter, and canopy cover. This will help show how fuels treatments may impact long-term forest resilience following wildfire.

Turetsky, Merritt

Merritt Turetsky is an Assistant Professor at the University of Guelph and holds a Canada Research Chair in Integrative Ecology. She has published papers on peat fires in Nature Geoscience, Nature Communications, and Global Change Biology.

Current and future vulnerability of northern peatlands to wildfire

Oral Presentation

Fire is increasingly appreciated as a threat to peatlands and their carbon stocks. The global peatland carbon pool exceeds the global vegetation carbon pool and is similar to the amount of carbon currently stored in the atmosphere. In undisturbed peatlands, most of the peat carbon stock typically is protected from smouldering due to ecohydrologic feedbacks that keep deeper peat layers moist even during drought conditions. Resilience to fire has increased peat carbon storage in boreal regions over long time scales. For example, burning gives Sphagnum a competitive advantage over feather mosses, thereby promoting peat accumulation and long-term ecosystem carbon storage. However, drying as a result of climate change and anthropogenic activity lowers the peatland water table and increases the frequency and extent of peat fires. Our ongoing research is assessing where and when peatlands will become more vulnerable to deep smouldering, given the importance of these peat layers to global carbon cycling, permafrost stability, and a variety of other ecosystem services in northern regions.

Urban, James

James Linwood Urban is a NDSEG Fellow at the University of California Berkeley. His Master's Project and current PhD research have focused on the ignition of natural fuels by hot metal particles as well as the production and transport of these hot metal particles through both experiments and computational physics-based simulations.

Comparing Flaming and Smoldering Spot Ignition of Natural Fuels by Hot Aluminum Particles

Oral Presentation

The ignition of combustible material by hot metal particles is an important pathway by which wildland and urban spot fires are started. Upon impact with a fuel, such as dry grass, duff, or saw dust, these particles can initiate spot fires or a smolder. In spite of interest in this subject, there is little work published that addresses the ignition capabilities of hot metal particles landing on natural fuels. This work is an experimental study of how the flaming and smoldering propensities of powdered fuel beds in contact with hot aluminum particles are affected by differences in the fuel bed characteristics, particularly the density and chemical composition. In the experiments, aluminum particles ranging from up to 8mm in diameter are heated to various temperatures between 575 – 1100oC and dropped into the different fuel beds. The fuels tested were powdered alpha cellulose (a major component of woody biomass) and a powder formed from mechanically grinding a dry barley/wheat/oat grass blend. Comparing the ignition characteristics of these fuels will give insight into the effects of the addition of non-cellulosic compounds such as hemi-cellulose and lignin on the conditions which could initiate spot fires from metal particles.

Vaillant, Nicole

Nicole Vaillant is a fire ecologist with the USDA Forest Service, Pacific Northwest Research Station, Western Wildland Environmental Threat Assessment Center.

An evaluation of the Forest Service hazardous fuels treatment program – Are we treating enough in the right places?

Oral Presentation

Under the guidance of the National Fire Plan the use of fuel treatments to reduce the likelihood of uncharacteristic fires has increased over the past decade. The FLAME Act of 2009 and resulting National Cohesive Strategy re-iterate the need to revisit wildland fire management in the US. One of the three core goals of the Cohesive Strategy is to restore and maintain fire-resilient landscapes, by implementing landscape scale fuels management activities to reduce fuels and mitigate wildfire risk. With the development of nationally available geospatial data it is possible to critique the Forest Service fuel treatment program. The goal of this work was to see if we, as an Agency, have been treating in the correct location to 1) restore and maintain resilient landscapes and 2) reduce wildfire hazard. LANDFIRE fire return interval data was used to determine how frequent lands burned historically to quantify how many acres are required to treat to “keep up” with nature. The Wildfire Hazard Potential map, designed to help inform evaluations of wildfire risk or prioritization of fuels management needs, was used to define wildfire hazard nationally. LANDFIRE disturbance data was used to spatially define where hazardous fuel treatments and unplanned ignitions have occurred.

Fuel accumulation and forest structure change following fuel treatments in California

Poster Presentation

Altered fuel conditions coupled with changing climate have disrupted fire regimes of forests historically characterized by high-frequency and low-to-moderate-severity fire. Managers use fuel treatments to abate undesirable fire behavior and effects. Short-term effectiveness of fuel treatments to alter fire behavior and effects is well documented; however, long-term effectiveness is not well known. We evaluated surface fuel load, vegetation cover and forest structure before and after mechanical and fire-only treatments over 8 years across 11 National Forests in California. Eight years post treatment, total surface fuel load returned to 67 to 79% and 55 to 103% of pre-treatment levels following fire-only and mechanical treatments respectively. Herbaceous or shrub cover exceeded pre-treatment levels two-thirds of the time 8 years after treatment. Fire-only treatments warranted re-entry at 8 years post treatment owing to the accumulation of live and dead fuels and minimal impact on canopy bulk density. In general, mechanical treatments were more effective at reducing canopy bulk density and initially increasing canopy base height than prescribed fire. However, elevated surface fuel loads, canopy base height reductions in later years and lack of restoration of fire as an ecological process suggest that including prescribed fire would be beneficial.

Vakili, Emma

Emma Vakili is a graduate research assistant at Colorado State University and the current national president of the Student Association for Fire Ecology. After graduation in December she will be joining the US Forest Service as a pre-sale forester on the Medicine Bow-Routt National Forest.

Fuel Treatment Effects on Spatial Variability of Surface Fuels in Ponderosa Pine Forests of the Southern Rocky Mountains

Oral Presentation

Fuel reduction treatments have been widely employed in dry forests of the western United States in recent decades as a means to decrease the severity of wildfires. Accurate fuels inventories are necessary to design and assess effects of fuel reduction treatments, but efforts to do so are complicated by the spatial complexity of fuelbeds and a lack of knowledge about the effects of fuels treatments on this complexity. The goals of this study were to quantify the spatial variability and total surface fuel loading for untreated, mechanically treated only, and mechanically treated and broadcast burned ponderosa pine forests across the southern Rocky Mountains. Total surface fuel loading decreased in both treatments relative to untreated sites with thinned only fuel loads decreasing by ~10% and the thinned and burned loads decreasing by ~50%. Fuels generally varied at spatial scales below 3 meters, and those scales increased with the diameter of fuel particles. Loading at these scales varied by over 100% for all surface fuel components, with spatial variance increasing as a function of average site-level loading. Results indicate that sampling densities should be increased for smaller fuel particles and for sites with higher fuel loadings to achieve accurate fuel loading estimates.

van Mantgem, Phillip

Phil van Mantgem is a Research Ecologist with the US Geological Survey, stationed in Arcata, California. Dr. van Mantgem's research interests include forest dynamics (with an emphasis on climate change impacts), fire ecology and the management of forested ecosystems. He received his doctorate in Ecology from the University of California, Davis. He has been studying (and enjoying) forests in the western US since 1995.

Duration of fuels reduction following prescribed fire in coniferous forests of western U.S. national parks

Oral Presentation

Prescribed fire is a widely used forest management tool, yet the long-term effectiveness of prescribed fire in reducing fuels and fire hazards in many vegetation types is not well documented. We assessed the magnitude and duration of reductions in surface fuels and modeled fire hazards in coniferous forests across several western U.S. national parks, using observations from a prescribed fire effects monitoring program up to >20 years post-fire. Prescribed fire effects were highly variable among plots, but we found on average first-entry fires resulted in a significant post-fire reduction in total surface fuels, with return to pre-fire fire total fuel loads at 15 years post-fire. Fuel particle size distributions changed as well, with a greater representation of large fuels after fire. Rates of recovery varied among estimates of crown fire hazard (e.g., modeled flame lengths, canopy base heights), but some estimates of fire hazard appeared to return quickly to pre-fire conditions, while others remained below pre-fire conditions >20 years post-fire. Our results show that prescribed fire can be a valuable tool to reduce fire hazards and, depending on the measurement, reductions in fire hazard can last for decades.

Prescribed fire promotes resistance to drought in ponderosa pine forests of the Sierra Nevada, California

Oral Presentation

It is commonly assumed that the reduced forest density following prescribed fire reduces competition for resources among the remaining trees, so that the remaining trees are more resistant (more likely to survive) in the face of additional stressors, such as drought. Yet this proposition remains largely untested, so that managers do not have the basic information to evaluate if prescribed fire may help forests adapt to a future of more frequent drought. Following two years of drought, in 2014 we surveyed 5981 trees in 28 burned and 13 unburned ponderosa pine – mixed conifer plots at Sequoia, Kings Canyon and Yosemite national parks. Fire had occurred in the burned plots from 6 to 27 years before our survey. After accounting for differences in individual tree diameter, trees found in the burned plots had significantly reduced mortality probabilities. Stand density (number of stems per hectare) was significantly lower in burned versus unburned sites, supporting the idea that reduced competition may be responsible for the differential drought mortality response. At the time of writing, we are not sure if burned stands will maintain lower tree mortality probabilities in the face of the continued, severe drought of 2015.

Vara, Javier

Javier Vara works as a GIS Analyst for the Texas A&M Forest Service, Forest Resource Protection Department. Javier has over 9 years of Fire Mitigation and Suppression experience is Spain, and currently responsible for administering and proving support to both the Texas Wildfire Risk Assessment Portal (TxWRAP) and the Southern Wildfire Risk Assessment Portal (SouthWRAP). Javier has also provided assistance to update and enhance the Southern latest Southern Wildfire Risk Assessment and highly familiarized with the process to develop detailed vegetation, fuel model and GIS datasets for these assessments, focusing on the integration of these data for planning and operational use.

Texas Wildfire Risk Assessment Portal: Arming Texas With Tools for Fire Protection Planning

Oral Presentation

Texas A&M Forest Service (TFS) launched the first online risk assessment portal in the Nation in 2012. The Texas Wildfire Risk Assessment Portal or TxWRAP is the primary mechanism by which TFS deploys risk information to create awareness among the public and arm local, state and federal planners with tools to support mitigation and prevention efforts. TxWRAP leverages the latest GIS technology and is comprised of a suite of applications tailored to support specific workflow and information requirements for the public, local community groups, government officials, professional hazard-mitigation planners, and wildland fire managers. Since its release, TxWRAP has been used by a large and diverse audience of nearly 1,500 registered users and over 40,000 individual public users. It has quickly become the preferred source of information to help communities develop sound prevention and hazard mitigation planning strategies, particularly through the formal creation of Community Wildfire Protection Plans (CWPPs) and Hazard Mitigation Plans (HMPs). The presentation will provide an overview of TxWRAP tools and functionalities and how they can be collectively used to quickly obtain risk information and support mitigation and prevention efforts across the state.

Varner, J

Morgan Varner is Assistant Professor of Fire Ecology at Virginia Tech and Chair of the Coalition of Prescribed Fire Councils. His research is focused on post-fire tree mortality, fuels management, plant flammability and fire-adapted traits, and the operational impediments to prescribed fire use. His research has been focused on southern USA pine woodlands, Pacific West USA oak woodlands and mixed-conifer forests. He serves on the editorial boards of Forest Science, Fire Ecology, and the International Journal of Wildland Fire.

Agents of Death: Fire managers' balancing act between desired and undesired tree mortality

Oral Presentation

For fire managers, tree mortality is foundations- whether positive or negative- to nearly all management objectives. This is particularly true in the application of prescribed fire, where burn objectives commonly delineate desired mortality of target species while simultaneously constraining impacts on fire-tolerant species. Fire is often not a precise tool, however, and many documents examples exist where this fine line of balanced mortality and survival produce unexpected results. These negative outcomes are only likely to increase as ecosystems deviate from historical norms and beyond the domain of managers' experiences. Understanding the causes, patterns, and impacts of mortality are critical for successful management. Mechanistic physiological understanding can increase the precision of managers to produce desired species mortality, while increasing confidence in decisions space to avoid negative outcomes. Understanding the patterns of mortality and their influence on future forest trajectories is critically important as managers experience novel ecological conditions outside of natural variation. While translating the science of mortality into manager-accessible tool that define objectives for prescribed burning and fuels treatments is required, uncertainties must be quantified for managers to avoid pitfalls inherent in fire effects prediction.

Post-fire tree mortality: coming to terms with increasing complexity

Oral Presentation

Understanding and predicting tree death following fire is among the most pressing issues in managing fire-prone ecosystems. Typical models to predict tree mortality include measures of first-order fire effects linked to coarse tree traits (bark thickness, height of crown) and fire behavior (crown scorch, basal duff consumption). These models have been overwhelmingly focused on western North American conifers, with general relationships applied to other species. In well-studied species, the lack of attention to the effects of neighboring competition is a major oversight. Pre-fire vigor and related measures of physiological condition have been reviewed before, but post-fire mortality models rarely quantify these effects. Two emergent global change-related effects further complicate post-fire relationships: changing climate and the role of non-native diseases and insects. Climate stress, particularly the effects of rising temperatures and diminished rainfall compromise trees ability to weather fire injuries. The interactions between non-native diseases and insects, as well as irruptions of native pests, can change local fire behavior with cascading effects on infected and proximal uninfected trees. Each of these complexities deserve attention as we design the next generation of post-fire tree mortality models.

Bridging gaps between managers and scientists: The southern pine duff story

Oral Presentation

There often exists a divide between management and research that prevents timely identification of applied research needs and development of management-relevant results. We describe a successful 15-year collaboration among managers and research scientists to understand fire-induced overstory mortality. This long-term collaboration began with the identification of widespread mortality events following reintroduction of prescribed fire to fire-excluded longleaf pine communities. To understand the phenomenon, the project relied on operational prescribed fires replicated across a span of forest floor moisture conditions at Eglin Air Force Base, Florida. Moisture thresholds were identified and a series of validation burns took place elsewhere in the region. To elucidate the causes of tree death, small experimental fires were then implemented at the Ordway-Swisher Biological Station and at Ft. Gordon, Georgia. These experiments required substantial manager involvement- at project inception, site selection, and during and after burning. Our findings have been widely adopted by fire managers across the region. From the science standpoint, the research represents a rare example of fire experiments characterized by replication in time and space. The successful collaborations have resulted in two additional JFSP-supported projects tackling issues of interest to regional managers and the fire science community.

Vega-Nieva, Daniel

Dr. Daniel J Vega has participated on more than 10 international projects on forest fire, forest management and biomass and bioenergy with partners from several European and North American countries, including: -NASA Project “Roses 2014 NRA Carbon Monitoring System” -ESA Project “EOEP-4 Data User Element, Innovators III, pioneering innovative Earth Observation products and services for long-term exploitation” -VII & VI Framework Projects: “Life + Bioenergy & fire prevention”, “Silvaplus”, “Ashmelt”, “Domoheat”. -INIA project: “Search of severity indicators and post-fire erosion mitigation techniques” in Spain. Currently is the coordinator of the CONAFOR project “ Development of a Fire Danger System for Mexico”

Developing of a Fire Danger System for Mexico

Poster Presentation

This presentation summarizes the goals of the 2015-2018 CONAFOR-CONACYT project “Development of a Fire Danger System for Mexico”. The project will be conducted by a consortium integrated by researchers from the following institutions from Mexico: UJED, CIIDIR, UNAM, CONABIO, CUCSUR-UdeG, and the following international partners: University of Washington (Seattle, USA), Pacific Southwest Research Station (US Forest Service, USA), Instituto Nacional de Pesquisas Espaciais (Brazil), Centro de Investigaciones Forestales de Lourizan (Spain). The goals of the project will be: -Analysis of existing Fire Risk and Danger systems for the prediction of fire ocurrence in Mexico. -Development of a Mexican Fire Risk System for the mapping of fire occurrence. -Development of a module for mapping fire area and severity in Mexico. -Development of a Fire Weather prediction system for Mexico. -Development of a Mexican Fire Danger System. -Development and transference of an free online software for real-time mapping of Fire Danger in Mexico.

Verble-Pearson, Robin

DR. ROBIN VERBLE-PEARSON IS AN ASSISTANT PROFESSOR OF FIRE ECOLOGY AT TEXAS TECH UNIVERSITY. SHE COMPLETED A PH.D. AT THE UNIVERSITY OF ARKANSAS AT LITTLE ROCK (APPLIED

BIOLOGY), AN M.S. FROM THE UNIVERSITY OF ARKANSAS (FOREST ENTOMOLOGY), AND A B.S. FROM THE UNIVERSITY OF SOUTHERN INDIANA (BIOPHYSICS). HER WORK PRIMARILY FOCUSES ON THE EFFECTS OF FIRE ON INSECT AND WILDLIFE POPULATIONS.

IMPACTS OF PRESCRIBED BURNING ON CENTRAL TEXAS HARVESTER ANT POPULATIONS

Oral Presentation

Ants are ecologically relevant organisms that can serve as indicators of habitat quality and indicators of restoration success. My collaborators and I examined harvester ant responses to prescribed burning in grasslands of central Texas. Specifically, we assessed how time since burn impacted ant abundance, density, and nutritional status. We found that fires did not impact ant abundance or colony density; however, harvester ant nutritional status differed in individuals collected from burned versus unburned areas. Given that harvester ants are important prey for threatened organisms such as the Texas horned lizard, these results have important conservation implications.

Vermeire, Lance

Lance Vermeire is a rangeland ecologist with the Agricultural Research Service at Fort Keogh Livestock and Range Research Laboratory in Miles City, MT. His research focus is on the interacting effects of fire, grazing, and precipitation.

Northern mixed prairie response to fire seasonality and return interval

Oral Presentation

A factorial experiment plus controls with three fire seasons (summer, fall, spring) and three return intervals (1, 3, 6 years) was implemented in eastern Montana (2006-2014) to assess fire effects on plant productivity and species composition. Fire season and return interval had interacting effects on most plant response variables. Fall fire with a 6-year return interval had the greatest current-year biomass (1476 kg ha-1) and summer annual fire had the least (1044 kg ha-1). Only the summer annual fire differed from biomass with no fire (1324 kg ha-1). Perennial grass biomass was greatest with fall annual and 3-year return intervals and least with annual summer fire, but all treatments (1098 kg ha-1) were similar to non-burned controls (1073 kg ha-1). Although fire had little effect on productivity, it caused considerable shifts in species composition. Frequent fall or summer fire increased C3 grass dominance (69 vs 54%) and reduced non-native plants (8 vs 24%), primarily Bromus japonicus, Bromus tectorum and annual forbs. Litter cover explained 61% of the variation in non-native composition and was reduced by all fire treatments except 6-year fall fire. Annual fires reduced standing dead material 50%. Data support use of fire to maintain northern mixed prairie integrity.

Watts, Adam

Adam Watts is Assistant Research Professor of Fire Ecology at the Desert Research Institute, and Division Lead for UAS projects in Atmospheric Science. His work includes fire ecology of wetlands, smoldering combustion, and unmanned aircraft systems (UAS) research and industry-liaison consulting. Previously a co-chair of the Student Association for Fire Ecology, Dr. Watts is the Financial Secretary for AFE and holds Wildland Fire Ecologist and Wildland Fire Practitioner certifications.

Wildland Fire Applications for Unmanned Aircraft: Evaluation and Commercialization

Poster Presentation

Unmanned Aircraft Systems (UAS) can be a powerful platform for performing and supporting many useful tasks for wildland fire operations and research. A number of missions from aerial reconnaissance to mapping and even aerial firefighting with UAS have been demonstrated, but the community of fire researchers and practitioners await the widespread adoption and regular use of this technology. We describe a project in collaboration with industry, USFS, and Parks Canada to investigate perceived effectiveness of UAS for operational fire use, and the factors affecting their commercial-scale employment. We will present initial results, and as a part of our presentation we also invite participation of the AFE community for planned further phases. We anticipate that the outcomes of our work will be useful to potential users who are unfamiliar with UAS, as well as to practitioners and industry with experience or an interest in their use in fire and related natural-resource disciplines.

Weill, Alexandra

Alexandra Weill is a PhD student in the Graduate Group in Ecology at UC Davis, with appointments as a Graduate Student Research in the Department of Plant Sciences and with the University of California Natural Reserve System's Institute for the Study of Ecological Effects of Climate Impacts. Her work focuses on the ecological and evolutionary responses of chaparral shrubs to temporal and spatial variation in fire regimes. She is also interested in fire-related outreach, communication, and education and won the Graduate Group in Ecology's Spurr Award for Outreach in 2014.

Fire and functional traits: how do fire-adaptive traits relate to historical, recent, and future fire regimes in post-fire reseeding Ceanothus species?

Oral Presentation

Wildfire is an important component of Mediterranean ecosystems, and plants living in Mediterranean regions are well-adapted to withstand or embrace disturbances, by means of traits such as thick bark, ability to resprout from underground structures, or seeds that are triggered to open or be dispersed following fire. When fire regimes shift due to human-caused ignitions, land management, or climate change, a population that was once well-adapted may be less resilient to fire. The historical strength of fire as an evolutionary pressure as well as the standing variation in fire-related traits in a population may serve as indicators of adaptive capacity of species in fire-prone systems. In this project, I am investigating the relationship between fire-adaptive traits of obligate reseeding Ceanothus species and the historical and modern fire regimes that they have experienced, using germination experiments and field observations. Variation in traits within and across populations can provide clues as to how precisely and how quickly plants have adapted to past and current fire regimes and suggest adaptive capacity of Mediterranean shrublands in the face of future change.

Weise, David

David R. Weise is a research forester with the USDA Forest Service in Riverside, CA. He has been involved in fire research since 1980 and is one of only a few people who have worked at all three of the original Forest Service fire laboratories (Southern, Northern, and Riverside). Over his career he has conducted research on many aspects of prescribed burning and his current research is focused on fire behavior in live shrub fuels.

Investigating the Effects of Kinetic Parameters on Fire Spread in Chaparral Fuel Beds

Oral Presentation

Use of the Wildland-Urban Interface Fire Dynamics Simulator (WFDS) to model fire spread in live shrub fuel beds has had limited success. One of the key processes that influences fire spread is thermal decomposition (pyrolysis) of the vegetation into gaseous products and char. Using the default linear decomposition, WFDS correctly predicted fire spread in one of 70 fires; use of Arrhenius decomposition improved the rate to 24 of 70 fires. We are conducting a sensitivity study to determine if changing the Arrhenius kinetic parameters further improves the modeling of fire spread in chaparral. The effect of two different sets of Arrhenius kinetic parameters on fire spread modeling in horizontal beds of single-species chaparral fuels burned with and without wind will be presented.

Whitman, Ellen

Ellen Whitman is a doctoral student at the University of Alberta, interested in the spatial ecology of wildfire. A recent publication focused on modelling fire regimes of north-western North America within climate space. Whitman, E.; Batllori, E., Parisien, M.-A., Miller, C.; Coop, J.D., Krawchuk, M.A.; Chong, G.W. & Haire, S.L. (2015) The climate space of fire regimes in north-western north america. Journal of Biogeography. 1-14. DOI: 10.1111/jbi.12533

Past burn severity and time since fire as drivers of current burn severity

Oral Presentation

The 2014 wildfires in the boreal forest of northwestern Canada were exceptional in terms of annual area burned. These fires burned vast regions of different stand origins and composition, presenting a unique opportunity to assess broad-scale ecological impacts of wildfire. Fire management and research suggest that past fires act as fire breaks where old burns slow active fires and moderate fire behavior, allowing intervention, yet the duration old burns may resist fire and the relationship between past and current severity of fire ecological impacts (burn severity) is unknown. We examined the relationship between stand age and past burn severity as drivers of recent burn severity and post-fire ecological trajectories in the 2014 wildfires. Burn severity, biomass, and stand composition were assessed using field metrics and the remotely sensed differenced normalized burn ratio. We showed a resistance of younger stands to reburning; however, when young stands did re-burn the remaining biomass was limited, given the cumulative nature of the disturbance, while a minima in severity of current ecological impact was reached where past fires were moderately severe. Where young stands reburn at high severity we suggest ecosystems may shift past a tipping point, leaving them deforested for years to come.

Wicks, Teresa

Teresa Wicks, PhD Student, Oregon State University. Teresa is a PhD Student in Forest Ecosystems and Society in the College of Forestry. Teresa's research interests center on all things feathered and include wildlife conservation, fire ecology, and the effects of climate change on bird communities. She is also interested in how scientists communicate their research to the public, citizen science, and creating community ownership of research and monitoring projects.

FIRE AND CAVITY NESTING BIRD COMMUNITIES: DO FIRE SEVERITY AND TIME-SINCE-FIRE MEDIATE COMMUNITY COMPOSITION AND NEST-WEB ASSEMBLAGES?

Oral Presentation

Secondary cavity nesting bird species (CNB) depend on cavities created by woodpeckers. Because of this relationship, CNB communities can be studied as nest-webs. Nest-webs, like food webs, diagram hierarchical relationships in an ecosystem, and are an important concept for understanding CNB community assemblages. Few current studies of CNB and fire examine community response to fire, and most focus on CNB response to time-since-fire or fire-severity. No studies examine the combined effects of time-since-fire and fire-severity on community and nest-web assemblages. In this study, we will determine the influence of fire severity and time-since-fire on CNB communities and nest-web assemblages. For the pilot season of this study, we relocated 100 cavities, with known excavators, in unburned and burned areas of Ponderosa Pine (Pinus ponderosa) dominated forests, in central Oregon. Of these cavities, 56% were unoccupied, 26% were broken or downed, and 18% were occupied. House Wrens (Troglodytes aedon) and woodpecker species were the most common species occupying relocated nests. I also located 74 nests incidentally. Preliminary results indicate a higher diversity of CNB in burned areas. Older high-severity burns were dominated by two woodpecker species, while the edges of high-severity areas appear to have the highest species diversity.

Wiggam, Shelly

Shelly Wiggam, Popenoe Fellow, Department of Entomology, Kansas State University. Shelly Wiggam is a Popenoe PhD research fellow and AAAS Making Our Case science policy fellow. Her research focuses on native pollinator responses to rangeland management practices throughout the Central Great Plains. Specifically, her research aims to realize management practices that restore pollinator diversity while maintaining landowner profitability and functionality. Shelly conducts substantial outreach to federal and state agency employees, private landowner coalition groups, and NGO directors and preserve managers. Additionally, she advises on science policy issues, and is a science advisor regarding insect habitat needs for inclusion in rangeland programs supported by federal and state agencies.

Patch-Burn Grazing Promotes Pollinator Diversity on Working Ranches

Oral Presentation

Rangelands in North America are managed primarily for livestock production, yet they have enormous potential to conserve native biodiversity while maintaining livestock productivity. Although pollinators are critical to the maintenance of healthy rangelands, ecosystem services, livestock production, and economies, they are a group of wildlife of greatest conservation concern that would benefit directly from changes in current rangeland management practices. This study examines native pollinator responses in cattle pastures throughout the Flint Hills ecoregion to the traditional rangeland management practice of annual-burn grazing as compared to the conservation grazing practice of patch-burn grazing. Results indicate a twofold increase in relative pollinator abundance in patch-burn grazing pastures as compared to annual-burn grazing pastures, which was driven by significant increases in both native bee and butterfly abundance. Additionally, there was a threefold increase in native bee species richness in patch-burn grazing pastures, and a twofold increase in butterfly species richness. Pollinator community composition was significantly more even in patch-burn grazing pastures, and community structure was more stable both spatially and temporally. These findings indicate that patch-burn grazing has significant potential to conserve and restore one of North America's most endangered groups of wildlife with one of its most dominant land-use enterprises.

Wilkin, Kate

Kate was first mesmerized by ecological processes in Florida, the lightning strike capital of the US, where she witnessed yearly floods and fire catalyze native biodiversity and ecosystem health. Intrigued by plants' response to fire, she focused on chaparral's resilience to fire for an MS. During this time she completed prescribed fires and became acutely aware of California fire management difficulties. This difference caused Kate to expand her interests and engage in the management discussion as a PhD student at University of California, Berkeley. Today her research informs management for wildlands and their urban interface during climate change.

Does Pyrodiversity Beget Biodiversity?

Oral Presentation

Fire suppression and climate change detrimentally affects valued forest resources especially in California's Sierra Nevada mixed conifer zone (1, 2). These forests can be maintained with active management if we understand the post-fire recovery of how historical fire regimes (including frequency, severity, season, and patch size) fostered diverse, resilient forests. Since 1973 managers have allowed lightning strike fires to burn freely in two fire-use areas in California -- Illilouette Creek Basin and Sugar Loaf Valley in Yosemite and Kings National Parks respectively. We investigate how pyrodiversity and environmental variation affects plants' and pollinators' post-fire trajectory. Research objectives include: What are the post-fire recovery pathways to forests with fire resiliency and higher biodiversity? Are management objectives focused solely on forest structure sufficient to capture biodiversity?

Shrubland fire hazard reduction has drawbacks for biodiversity

Oral Presentation

Fuel reduction treatments are widely used to reduce fire hazard. These protect humans, yet are not always beneficial for ecosystems. Short-term studies suggest land managers face an acute dilemma between protecting people or ecosystems. However, the long-term ecological trajectories and fire risks of fuel treatments are poorly understood. Using a 13-year replicated experimental study, we evaluate how fire risk, nonnative species invasion, native species diversity, and deer forage responded to fuel treatments in California's northern chaparral. Fuel reduction treatments (fire/mastication) and their season (fall/winter/spring) uniquely influenced plant communities and fuel loads. Controls had continuous shrub canopy with no understory throughout the study. Mastication retarded shrub recovery more so than fire, while increasing the number of nonnative plants, including annual grasses, and surprisingly, increasing the native preferred deer browse. The treatments' application season influenced these outcomes to a lesser magnitude. Fall fire and mastication treatments resulted in delayed shrub recovery, more nonnative plants, nonnative annual grasses, and preferred deer browse than spring or winter treatments. Long-term shrub species composition had little correlation with short-term recruitment results. We conclude that fire hazard reduction treatments change plant communities and only reduce fuel hazard for about 10 years, warranting thorough consideration before implementation.

Climate change refugia need fire management

Student Poster Presentation

Early climate change ideas predicted catastrophic species extinctions. As scientists probed more deeply into species responses, a more nuanced perspective emerged indicating that some species may persist in microrefugia

(refugia), especially in mountainous terrain. Refugia are habitat that buffer climate changes and allows species to persist in – and to potentially expand under – changing environmental conditions. While climate and species interactions of refugia have been noted as sources of uncertainty, land management practices and disturbances, such as wildland fire, must also be considered when assessing any given refugium. Areas thought to act as small-scale refugia, cold-air pools, have unique fire occurrence and severity patterns in frequent-fire mixed conifer forests of California's Sierra Nevada: cold-air pools have less fire and if it occurs, it is lower severity. Active management for climate change adaptation strategies may be required to maintain refugia.

Williams, Brett

Brett Williams serves as the Fire Ecologist and Wildland Fire Program Manager for the U.S. Air Force at Eglin AFB, Florida. Brett served as incident commander for the RX-CADRE prescribed fire research experiments hosted by Eglin AFB in 2012 and has co-authored a number of peer-reviewed articles in both wildland fire and longleaf pine ecosystems.

Next Generation Fire Modeling For Advanced Wildland Fire Training

Oral Presentation

Current fire spread models are inadequate for predicting the complex influences of atmosphere, forest structure, and self-generating fire processes on wildland fire behavior. FIRETEC is a physics-based, three-dimensional computer code, developed by Los Alamos National Laboratory (LANL), designed to capture what is a constantly changing, and interactive relationship between wildland fire and its environment. The Air Force Wildland Fire Center and LANL have initiated a project, funded by DoD's Environmental Security Technology Certification Program, to demonstrate and validate the capabilities of a fluid dynamics wildland fire spread model, FIRETEC, to simulate fire behavior from prescribed fires in southeastern fuels. The project proposes to: 1) compare FIRETEC model simulations to measured values of fire-induced wind velocities and heat release from experimental prescribed fires, 2) demonstrate the ability of FIRETEC to predict realistic fire phenomenological response to heterogeneous forest structure, wind speed, and firing pattern scenarios, and 3) disseminate modeling results and lessons learned to fire managers and practitioners. An overview of the project, initial simulation results, and lessons learned for designing field measurements to parameterize and validate next generation fire models will be presented and discussed.

Williams, Howard

Howard Williams, Research Assistant / GIS Analyst, The University of Montana. Masters Degree in Forestry Candidate.

Economic Efficiency of Landscape-scale Fuel Reduction and Home Ignition Zone Treatments to Mitigate Wildfire Risk in Montana, USA

Oral Presentation

Due to the expanding wildland-urban interface and projected effects of climate change in the northwestern USA, the future wildfire risk to assets will continue to increase, as will costs to suppress wildfires threatening these assets. There is a need for economic evaluation of wildfire risk mitigation policies. This paper economically evaluates the efficiency of alternative landscape-scale hazardous fuel reduction treatments and home ignition zone treatments to protect residential homes in a 1.2 M ha case study area in Montana over 50 years under the IPCC's A2 climate scenario, while assuming moderate economic growth in the region. Four landscape-level fuel reduction policies are modeled using the landscape fire and succession model FireBGCv2 their effects on landscape-level burn probabilities are estimated at decadal intervals using the large fire simulator, Fsim. The effects of five home ignition zone policies on home ignition probabilities are also simulated. The discounted costs associated with implementing each of the 20 combinations of wildfire risk mitigation policies is compared against the discounted expected avoided loss of residential homes due to wildfire. Findings from this study will inform economically efficient wildland fuel management, home ignition zone treatment and community development policies in the northwestern USA.

Wolk, Brett

BRETT WOLK is a Research Associate with the Colorado Forest Restoration Institute in the department of Forest and Rangeland Stewardship at Colorado State University. He has experience on diverse restoration research projects throughout the western USA, from mosses to forests to oil pads, from Alaska to Arizona. For much of the past 10 years, Brett has focused on understanding ecological responses to forest management in Colorado.

Assessing Fire Hazard Reduction Treatment Effectiveness On Non-Federal Lands In The Colorado WUI

Oral Presentation

While the majority of fuel treatment effectiveness knowledge comes from work on federal system lands, wildfire hazard mitigation on private, state, and local government lands in the Wildland Urban Interface (WUI) throughout the western U.S. has increased dramatically in recent years. Fire mitigation treatments are often most effective at modifying fire behavior and minimizing potential wildfire severity when mechanical harvesting methods are used to reduce tree density, followed by prescribed fire to minimize surface fuels. As mechanical fire mitigation activities increase on non-federal lands, implementing prescribed fire in the WUI remains challenging, potentially limiting mitigation effectiveness. We measured fuel loading on 280+ plots pre and post treatment across 30 non-federal land treatments throughout the Colorado WUI to assess fire hazard mitigation effectiveness. Fire hazard potential was analyzed using the Fuels Characteristic Classification System. Most treatments significantly decreased canopy fuels and active crown fire potential, improving potential fire suppression activities. However, mitigation treatments often resulted in no change or increased surface fire potential compared to pre treatment. Our results highlight the potential constraints and opportunities for improving non-federal land fuel treatment effectiveness in the WUI.

Wood, Tamara

Tamara Wood is currently a graduate research assistant at Stephen F. Austin State University at the Arthur Temple College of Forestry and Agriculture. Her project focuses on soft mast production following application of prescribed fire in restored pine woodlands in the Ouachita Mountains of western Arkansas. She graduated with a bachelor's degree in Forestry Wildlife management in December, 2014 from Stephen F. Austin State University.

Soft mast production following application of prescribed fire in restored pine woodlands in the Ouachita Mountains of western Arkansas

Student Poster Presentation

The use of prescribed fire is integral to restoration of open pine habitats in the southeast, including shortleaf pine woodlands in the Ouachita Mountains. Fire has many potential benefits for wildlife; however, short-term implications for soft mast production are not fully understood. The purpose of this study is to determine how fire affects soft mast producing plants and its influence on various habitat resources for multiple wildlife species. We inventoried sixteen stands representing four temporal periods after dormant season prescribed fires: within 1 year of burn, 2 years after burn, 3 years after burn and 5 years after burn. Stands were sampled by establishing 40 0.045 ha plots along 6 to 8 randomly located transects per stand and measuring number and biomass of all soft mast. Data collection occurred three times per growing season in June, July and August to capture a range of soft mast producing species. Soft mast specimens were collected each month while percent cover of soft mast species was collected in July during the peak growing season. The first year of data collection was completed in August 2015 and these results are presented here.

Woolley, Travis

Travis uses an understanding of ecological relationships in forested ecosystems and sampling/monitoring expertise to design and implement science-informed adaptive management and monitoring programs. In a collaborative framework, he also develops and promotes innovation in monitoring, modeling, and the use of science-based information in decision-making. Before coming to The Nature Conservancy, he designed and implemented research projects at Oregon State University examining a variety of forest health issues. Examples of research include snag creation for wildlife habitat, disease environment interactions, old-growth vs. re-growth forest structure, post-fire tree mortality, and bark beetle and fire interactions.

Reviewing Post-fire Tree Mortality Modeling for Western US Conifers: Past, Present, and where do we go from here?

Oral Presentation

The use of empirically developed predictive models, and thus their accuracy, is critical to post-fire management, prescribed burn planning, and understanding ecological processes and functioning following disturbance. A review of literature relating to coniferous tree species in the western USA indicates that logistic regression is currently the most widely used and available technique for predicting post-fire tree mortality. Over 100 logistic regression models have been developed to predict post-fire tree mortality for 19 coniferous species following wild and prescribed fires. The most widely used explanatory variables in post-fire tree mortality models have been measurements of crown and stem injury. Discrimination of dead and live trees post-fire improves when crown and stem variables are used collectively. With regard to validation of post-fire logistic regression models, recent research has shown that goodness of fit alone doesn't provide a full assessment of a model's ability to discriminate mortality of trees post-fire. Furthermore, the receiver operating characteristic curve (AUC) is only an average assessment of discrimination. A more comprehensive measure of discrimination may have more value to practitioners interested in post-fire tree mortality prediction. Overall, more mechanistic and process based modelling efforts are likely needed to move the field of research forward.

Wotton, Mike

Mike Wotton is a fire researcher with the Canadian Forest Service, currently stationed at the University of Toronto. His research focus is on developing models of fuel moisture and its linkages to the ignition and spread of fires for use as information tools in operational wildland fire decision making. He is working with others in the Canadian research community on the development of a next generation of the Canadian Forest Fire Danger Rating System.

Fire behavior and dynamic fuels complexes in the next generation of the Canadian Forest Fire Behavior Prediction System

Oral Presentation

The Canadian Forest Fire Behaviour Prediction (FBP) System is used throughout Canada in wildfire operations as well as for many research applications. The system was designed with 16 static fuel types which covered major Canadian forest types. Since its development however the need to predict fire in a broader range of dynamically changing fuel types has been identified. Many of these new 'problem' fuel types exhibit significant changes in fuel structure with time. Some of these arise from interaction of insect, climate and fire management (e.g., Mountain Pine Beetle) while others are a result of direct climate and forest interaction (e.g., blowdown). Recent research has also highlighted significantly changing fire behaviour potential in peatland bogs with time since disturbance and the potential implications of drought in these ecosystems. The Canadian Forest Service and its partners are in the process of developing a next generation of the FBP System. This presentation will describe how fuels will be handled in that new system to account for dynamically changing forest stands and fuel loads. It will also briefly introduce an FBP-based tool (CanFIRE) currently available to fire managers and researchers to allow fire behaviour prediction in dynamically changing or non-standard forest types.

Wright, Vita

A fire social science analyst for the USFS Human Performance RD&A, Vita Wright works for the Rocky Mountain Research Station (RMRS). She has been principal Investigator of the Joint Fire Science Program's Northern Rockies Fire Science Network since 2011. Her research specializes in understanding and improving the fire science application process. She is nearing completion of a PhD at the University of Montana in Missoula, where she is assessing individual and organizational influences on the use of fire science. Previously, Vita developed and led the Aldo Leopold Wilderness Research Institute's Research Application Program, which focused on improving wilderness science application.

Influences on the Use of Science by Fire Managers

Oral Presentation

Insights into science delivery and application processes in the context of land management can be gained from scientific literature on human behavior, communication, and organizations. Using social science theory and methods, I studied individual and organizational influences to the use of science by federal fire managers and decision makers. Results supported the 25-year-old Technology Acceptance Model, which showed beliefs about usefulness to be better predictors of use than beliefs about ease of use. Beliefs and attitudes toward research were diverse, with National Park Service managers, fire ecologists, and those with graduate education showing more positive attitudes toward research, more use of research, and more frequent relationships with scientists. Survey respondents were separated into early and late adopters, allowing the Diffusion of Innovation theory to be used to develop communication strategies to shorten the time to diffusion. In addition, perspectives on organizational culture and process for innovation and learning varied by pay grade level. The following characteristics of learning organizations showed the most room for improvement: time for reflection, appreciation of differences, and analysis of assumptions. Recommendations are provided for scientists, science communicators, and upper level land managers interested in bridging the gap between science and decision making by fire managers.

The Decision to Manage Fire: Insights from Wilderness Fire Managers in the Northern Rockies

Oral Presentation

The decision to allow wildfire to burn on its own terms, and for long duration, is one of the most challenging yet important decisions a manager can make. It can involve high risks, uncertain outcomes, and the decision is often faced in an unsupportive, even contentious, social and political environment. For the past 40 years, wilderness managers in the Northern Rockies have faced these challenges and taken advantage of the vast wilderness in the region to learn how to use natural ignitions to accomplish ecological benefits. Many of the champions for wilderness and long duration fire have lived and worked in the Northern Rockies, making the region a hub of knowledge and experience on the topic. To capture this knowledge, we interviewed thirty fire managers, fire scientists, and decision makers about the legacy of wilderness fire management in the Northern Rockies. Including interview clips, this presentation draws from the wisdom and insights of those who have a reputable history of managing wilderness fires. Interviewees discuss conditions that allow for successful management of long duration fires, challenges associated with fire management decisions in and near wilderness, and the outcomes of both suppression and management for multiple objectives decisions.

Spanning boundaries in the Northern Rockies: Understanding audiences as a critical piece of the science delivery puzzle

Oral Presentation

To avoid the pitfall of one-way communication from scientists to managers, the Joint Fire Science Program deliberately initiated the regional Fire Science Exchange Networks as "exchanges," which develop programs of work with substantial input from the intended audiences: those involved in fire and fuels management decisions and implementation in the region. All exchanges conducted needs assessments prior to implementation. Similar to other exchanges, the Northern Rockies Fire Science Network developed its website, searchable resource database, field trips, webinars, and other products based on feedback from potential science users. We obtained feedback on priority topics, ecosystems, and communication methods through an initial quantitative survey and qualitative focus groups in 2011, a 2013 follow-up survey, and periodic interactive web forums. In addition, we conducted a phone survey to identify the flow of scientific information supporting fire effects and fuels management through informal professional communication networks. In this presentation, we use the Northern Rockies Fire Science Network as an example of how the exchanges have evolved based on input from potential science users and where we are in the process of becoming an effective boundary spanning organization.

Wright, Micah

Micah Wright is a second year masters student in the Graduate Degree Program in Ecology at Colorado State University, where he is advised by Monique Rocca. After working eight seasons for the Washington State Department of Natural Resources, Micah is currently investigating post-fire lodgepole pine regeneration in the Northern Front Range of Colorado.

Characterizing the effects of Burn severity, mountain pine beetle, and microhabitat on lodgepole pine regeneration following the High Park Fire

Oral Presentation

Recent trends suggest that future fires are likely to burn through bark beetle infested stands, raising concerns that a combination of fire and bark beetles could influence the regeneration of key forest species, including lodgepole pine (Pinus contorta). We are investigating the influence of burn severity, mountain pine beetle (Dendroctonus ponderosae), and microhabitat on lodgepole pine regeneration following the 2012 High Park Fire using a combination of remote sensing and field data. We recorded microhabitat variables and seedling density in 70m plots stratified for burn severity and pre-fire mountain pine beetle. We hypothesized that lodgepole pine regeneration would be reduced in areas that experienced high burn severity and pre-fire mountain pine beetle. We also anticipated that sites with more suitable microhabitats, such as those with lower angled slopes or those that experienced post fire mulching treatments, would have a greater abundance of lodgepole seedlings. Preliminary analysis of 2014 field data suggests that post-fire lodgepole pine regeneration is reduced following higher levels of burn severity and the presence of mountain pine beetle; the lowest seedling densities were found where these variables were combined. Microhabitats with a more abundant seed source had greater lodgepole pine regeneration densities; most other microhabitat variables were not strongly associated with lodgepole pine regeneration. These findings suggest that site suitability is less important for lodgepole pine regeneration than the presence and viability of seed.

Yocom, Larissa

Larissa is a research associate at Northern Arizona University with interests in fire ecology, forest ecology, and climate influences on ecosystems.

Historical high-severity fire patches in mixed-conifer forests, Grand Canyon National Park

Oral Presentation

Two ends of the fire regime spectrum are a frequent low-intensity fire regime and an infrequent high-intensity fire regime, but intermediate fire regimes combine high- and low-severity fire over space and time. We used fire scar and tree age data to reconstruct fire regime attributes of mixed-conifer and aspen forests in the North Rim area of Grand Canyon National Park, with a goal of estimating patch sizes of historical high-severity fire and comparing them to modern patch sizes. We used three methods, based on 1) aspen groves, 2) even-aged stands, and 3) inverse distance weighting to estimate occurrence and patch sizes of historical high-severity fire. Evidence of high-severity fire was common in the 1800s, and high-severity fire years were associated with drought. High-severity fire patch sizes likely ranged from 10-1 to 102 ha. However, the forest is quite young and we cannot rule out a historical large high-severity fire that could have reinitiated much of the 1400 ha study area. Fire scars, which are indicative of low-severity fire, were also common. Historical fire was likely heterogeneous across the landscape. Maintaining heterogeneity of fire severity, size, and frequency would promote heterogeneity of forest structure and composition and resilience to future disturbances.

Wildfire as fuel treatment: effects on subsequent fire size, severity, and management factors in the Southwest

Oral Presentation

Do wildfires act as fuel treatments by affecting subsequent wildfire behavior and management options? We tracked the fate of wildfires that started inside and outside of previous wildfire perimeters and compared the results. Our objectives were to determine how past fires influenced: 1) subsequent fire size, 2) subsequent fire severity, and 3) opportunities for different management strategies, measured by subsequent fire flame length and suppression units responding. Data was obtained from FIRESTAT and the Monitoring Trends in Burn Severity (MTBS) program. We included fires since 1984 from all forests in Region 3 (Southwest) to analyze a wide range of land cover, including forests, grasslands, and shrublands. We also included topographic and weather variables in our analysis, allowing us to evaluate a suite of factors that enable wildfires to exert an influence on subsequent fire behavior and effects. We found that wildfires do act as fuel treatments by influencing subsequent fire characteristics. The strength of the influence varied with contributing factors. Projections of a warmer and drier future climate will likely continue to drive current trends of increasingly large wildfires, and may result in greater pressure to implement effective fuel treatments and include wildfire in fuel treatment calculations and management decisions.