ABSTRACTS AND PRESENTER BIOGRAPHICAL INFORMATION
ORAL PRESENTATIONS

Abstracts for oral presentations and biographical information for presenters are listed alphabetically below by presenting author's last name. Abstracts and biographical information appear unmodified, as submitted by the corresponding authors. Day, time, and room number of presentation are also provided.

Abatzoglou, John

John Abatzoglou, Assistant Professor of Geography, University of Idaho. Research interests span the weather-climate continuum and both basic and applied scientific questions on past, present and future climate dynamics as well as their influence on wildfire, ecology and agriculture and is a key player in the development of integrated climate scenarios for the Pacific Northwest, US.

Oral presentation, Wednesday, 2:30 PM, B114

Will climate change increase the occurrence of megafires in the western United States?

The largest wildfires in the western United States account for a substantial portion of annual area burned and are associated with numerous direct and indirect geophysical impacts in addition to commandeering suppression resources and national attention. While substantial prior work has been devoted to understand the influence of climate, and weather on annual area burned, there has been limited effort to identify factors that enable and drive the very largest wildfires, or megafires. We hypothesize that antecedent climate and shorter-term biophysically relevant meteorological variables play an essential role in favoring or deterring historical megafire occurrence identified using the Monitoring Trends in Burn Severity Atlas from 1984-2010. Antecedent climatic factors such as drought and winter and spring temperature were found to vary markedly across geographic areas, whereas regional commonality of prolonged extremely low fuel moisture and high fire danger prior to and immediately following megafire discovery. The results also illustrate that biophysical metrics provide a more direct link to proxies for fuel flammability and fire-behavior than individual meteorological variables and provide a potential means to narrow the gap between statistical and processed-based fire models. An initial qualitative assessment of how these results factored into megafires in fire season 2012 is provided. Finally, both a qualitative and statistical modeling approach using our findings is applied to climate scenarios generated from the fifth phase of the Coupled Model Intercomparison Project to assess regional changes in megafire frequency under anthropogenic climate change experiments.

Adams, Theodore

Theodore Adams is a graduate research assistant NCFLA, University of Montana and lead forestry technician at the Payette National Forest.

Oral presentation, Thursday, 2:30 PM, C126

Balancing the benefits of advanced education with the continuance of a career in wildland fire

While pursuing a career in the federal wildland firefighting service, many individuals make the decision to pursue post-baccalaureate education beyond what is often required for most operational and managerial fire positions. How these individuals balance the requirements of graduated education and fire career advancement is an intriguing question. The perspectives of select individuals who successfully navigated these divergent paths is presented here. Identifying the intentions, motivations, and thoughts of career wildland firefighters who choose to subject themselves to academic rigor while simultaneously pursuing professional opportunities in the field may help to guide other like-minded individuals throughout the fire community. Recruiting and enabling these highly skilled, motivated, and educated individuals can bridge the gap between practitioners and researchers by having several intermediaries that can speak the language of research, education, and management.

Ager, Alan

Alan Ager is an Opeations Research Analyst at the Western Wildland Environmental Threat Assessment Center and studies the application of risk science and landscape modeling to address wildfire management issues within the USDA Forest Service

Oral presentation, Tuesday, 2:30 PM, B116

Spatial prioritization of restoration and fuel management in fire adapted forest ecosystems

Forest restoration activities on national forests in the US cover about 1.5 million ha annually and include thinning, mastication of surface fuel, and underburning. The long-term goal of this program is to restore ecological resiliency on expansive areas of fire prone forest ecosystems. The current prioritization of restoration projects often lack consideration of the spatial arrangement of treatments, and a framework for sensitivity analyses to understand how specific fuel management strategies affect long-term restoration goals. We developed and tested a spatial model for prioritizing forest restoration projects based on the concept of "low intensity fire containers." The model builds contiguous project areas within which fire behavior is restored with treatments where needed, and locates the optimal project where stated restoration objectives are maximized. We tested the model on a 245,000 ha forest landscape and conducted a sensitivity analysis to understand tradeoffs between alternative treatment strategies. The model located optimal projects for restoration and identified treatment areas within them, although the location was dependent on the treatment density and total treatment area associated with a particular scenario. We found that a high density of treatments (>80% of the project) under a fixed level of treatment area allowance resulted in relatively small projects, thereby leaving the larger landscape at risk for fire. Conversely, low density treatment scenarios created larger projects, but ecologically important old growth forests were left susceptible to wildfire mortality. Intermediate treatment densities (35%) were optimal in terms of the overall reduction in the potential wildfire mortality of old growth. The approach contrasts previous work on spatial optimization in fuel management where fire spread is blocked with strategic fuel breaks. The work expands the application in spatial optimization to the problem of dry forest restoration, and defines spatial planning goals for restoration programs.

Ager, Alan

(See biographical information, above.)

Oral presentation, Wednesday, 2:05 PM, B113

Integrating wildfire into the Envision agent-based landscape model

Projecting the future effects of climate change on coupled natural/human systems has become increasingly important in a wide array of land use planning and policy contexts. We are using the agent based model Envision to examine coupled effects of wildfire, climatic and land use changes in western Oregon's Willamette Valley Ecoregion (WVE). Individual decision makers (actors) within Envision respond to a suite of factors including climate, land use regulation and incentives, land markets, fire hazard, land management costs and aesthetics. Agent behaviors were parameterized probabilistically based on a survey of study area landowners as well as census and other local data. We are testing three hypotheses: 1) climate change will lead to altered fuel loads and greater wildfire hazard in the WVE; 2) current WVE land use trajectories will lead to increased wildland-urban interface area and changes in vegetation that together increase the risk of wildfire and loss of imperiled ecosystems; and 3) some policy sets will be more robust than others in managing fire risk and sustaining imperiled ecosystems across a range of future climate scenarios. Integrating wildfire within Envision was particularly challenging given the complexity of the agent-based modeling environment, and uncertainty associated with wildfire in a changing climate change. We built a fire modeling application within Envision using the minimum travel time fire spread algorithm in FlamMap. Each time step (e.g. 1 year) the application interface obtains the current state of the landscape from Envision in terms of vegetation and fuels and then reads a list of fires and associated simulation parameters from a stand-alone fire generator. The latter predicts fire probability and size using relationships between daily energy release component and fire history. The mechanics of the simulation system will be described along with example simulation outputs.

Ager, Alan

(See biographical information, above.)

Oral presentation, Tuesday, 11:25 AM, C121

Leveraging wildfire risk assessments for fuel management planning

The need to justify fuel management expenditures and document progress towards wildfire risk reduction continues to grow as federal land management agencies face reduced budgets and a growing wildfire problem. Oversight agencies have called for risk-based allocation of fuel management investments, and for monitoring wildfire risk over time. While there are many advances in the application of risk science to fuel management problems, a clear path to achieve long management goals remains unclear. At the core of the problem is the lack of a comprehensive risk assessment that establishes a benchmark of current risk from which to measure the impacts of fuel management programs. A related problem is that prioritization of fuel management activities lack consistent risk based methods at the various scales at which funding deci-

sions are made. This presentation will discuss how information from risk assessments can be used to inform specific fuel management planning activities, and potentially improve current process for funding allocation decisions and monitoring long term change in wildfire risk.

Agner, Shannon

Shannon Agner is a student at the University of Montana.

Oral presentation, Thursday, 3:25 PM, C126

Exposure to knowledge and skills necessary for success in wildland fire through participation in extra-curricular student activities

Extracurricular activities at the University of Montana provide students with opportunities to gain experience in various aspects of wildland fire ecology and management. This presentation focuses on the Student Association of Fire Ecology and Management, the Forestry Students' Association, and the Foresters' Ball. Each of these student groups and student sponsored events provides experience and skills that aid in preparing students for careers in wildland fire. While participating, student members are exposed to leadership, responsibility, research, and professional networking. Hands on experience gained while participating in events often consists of wildland urban interface hazard assessment and mitigation, incident management and organization, chainsaw handling, prescribed burning, teamwork, and collaboration. The knowledge and experience gained is available to all students who attend the University of Montana and are not specific to particular majors. The College of Forestry and Conservation extracurricular student opportunities require only participation and have proven to be beneficial to students pursuing careers in wildland fire, whether they are in fire research, education, or management.

Anderson, M. Kat

M. Kat Anderson is an Ethnobotanist working for the Natural Resource Conservation Service located at the University of California Davis.

Oral presentation, Tuesday, 3:50 PM, B118

California Indian Ethnomycology and Associated Fire Management,

Many California Indian tribes utilized mushrooms for food, medicine and/or technological purposes. This presentation summarizes which mushrooms were important to different California Indian tribes in historic and modern times and how they were harvested, prepared and stored. Oral interviews were conducted and the ethnographic literature reviewed to detail the extent and complexity of indigenous knowledge about fungi harvesting and associated ecological-fire habitat relationships. Through two case studies, indigenous burning practices of several tribes in the lower montane mixed-conifer forests of the central and southern Sierra Nevada, and the mixed-evergreen forests of northern California are described. Additionally, tribal knowledge of fire regimes and fire effects on mushroom habitat quality will be presented. The potential ecological effects of Indian burning on these forests at different levels of biological organization is explored. The presentation concludes by offering suggestions for research, management, and restoration practices needed to perpetuate useable mushrooms regarding fire and fuels management.

Anderson, McRee

McRee Anderson is The Nature Conservancy's Fire Restoration Project Director in Arkansas and South-Central Leader for the Fire Learning Network, with 15 landscape-scale project sites totaling one-half million acres. As Arkansas' Project 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 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.

Oral presentation, Thursday, 11:00 AM, B116

"Fanning the Flames: The Big Ideas, Bold People and Best Practices Driving Prescribed Fire in the US"

Collaborative fire management planning depends on land managers across the region finding common ground in their understanding of ecosystem structure and function and in estimates of desired future ecological conditions. Over the last few

years, a broad group of organizations have come together and are currently engaged in several large landscape-scale restoration projects to restore oak-hickory and oak-pine ecosystems throughout the Interior Highlands of Arkansas. The goals of these activities are to increase forest health, restore fire dependent woodland ecosystems, fire safety in the wildland/urban interface and protect municipal water sources and water quality. Historically, low intensity surface fires burned these through these systems about every 2-7 years. Plant and animal species once common and broad ranging under the more frequent fire regime are now identified as "Species of Greatest Concern" in the States' Wildlife Action Plan. Historic records indicate that pre-settlement Ouachita and Ozark woodlands averaged around 38-76 trees per acre. Current densities in much of the region average 300-1000 stems per acre. Restoring this ecosystem takes partnerships grounded in science with a common long-term vision and commitment. There restoration efforts have been cultivated by Arkansas Prescribed Fire Council, Oak Ecosystem Restoration Team and the South-Central Fire Learning Network. These collaborative groups have continued to institutionalize prescribed fire and wildfire training, adaptive management and monitoring, regional fire science, and public education and outreach across the region. These collaborative efforts continue to attract funding streams from a variety of sources that supports the long-term restoration efforts in the region.

Anderson, McRee

(See biographical information, above.)

Oral presentation, Tuesday, 3:50 PM, B116

Building a Sustainable Fire Management Program in Kafue National Park, Zambia through collaborative Fire Training Exchanges: A Case Study

Building a Sustainable Fire Management Program in Kafue National Park, Zambia through collaborative Fire Training Exchanges: A Case Study The Kafue Ecosystem in western Zambia is a 16.7 million acre complex of intact woodland and seasonally flooded grasslands that is dominated by the Kafue River and its tributaries. This ecosystem encompasses the fifth largest park in the world, Kafue National Park - a 5.5 million acre protected area managed by the Zambian Wildlife Authority (ZAWA). One of the main perceived threats to Kafue National Park is the scale of the annual burning that occurs with park boundaries. In a five month period, over 8 million acres are burned every year. As a result of this fire frequency and scale, the Zambia Wildlife Authority, The Nature Conservancy and other partners have teamed up to begin a multi-year Fire Training Exchange to address this complex issue.   In May 2012, this collaborative partnership conducted the first in a series of "Fire as a Management Tool" training workshops for Zambia Wildlife Authority staff at Kafue National Park. Over 20 participants from all across the park attended the 10 day training exchange. The workshop provided an overview of the current state of fire knowledge in Zambia, trained participants on concepts in fire weather, fire behavior, monitoring, and fire implementation. This course provided participants with basic tools for safe and effective use of fire that will accomplish specific resource management goals and desired fire management objectives. Finally, one of the key strategies being implemented is the development of a large collaborative landscaple-scale "Fire Demonstration Project" across the northern section of the park. This project will use methods learned from the Fire Learning Network to host a series of scientifically driven workshops to help partners develop a long term strategy for sustainable fire management in Kafue National Park.

Anderson, Paul

Paul Anderson, Supervisory Research Forester, USDA Forest Service, Pacific Northwest Research Station

Oral presentation, Tuesday, 11:00 AM, C120

Development of Planted Conifers in Postfire Restoration Treatments in Southwestern Oregon

Post-fire restoration objectives for federal lands in southwestern Oregon, can include development of compositionally and structurally diverse forests that provide a range of benefits, eventually including late-seral habitats. Post-fire tree planting is often intended to promote the return of forest cover. In contrast to timber production, the effectiveness of conifer planting for meeting both short- and long-term restoration objectives is not well documented. The 2002 Timbered Rock Fire burned with mixed severity 10,900 hectares of the Elk Creek Watershed, southwestern Oregon. As a component of the watershed restoration, we implemented a study to characterize post-fire vegetation development under different reforestation options on federal lands. In 2003, experimental reforestation treatments consisting of mixed-conifer or mono-specific Douglas-fir plantings, two planting, and removal or retention of interacting woody vegetation were implemented in contrasting environments of northern and southern exposed slopes. Subsequent assessments of survival and growth of the planted conifers, in addition to composition, percent cover and height of herbaceous and woody vegetation were conducted 2004-2006, and 2008. Survival of planted seedlings was variable among blocks, species, and treatments but overall

mean survival declined from 82% in 2004 to 74% in 2008. Planted incense cedar had slightly greater mortality rates than Douglas-fir, ponderosa pine and sugar pine seedlings. Manual cutting of sprouting woody vegetation increased fifth-year height and diameter by11.8% and 30.1%, respectively. Douglas-fir and ponderosa pine growth exceeded that of incense cedar and sugar pine over the study period. Influences of planting density and mixed- versus mono-specific composition were undiscerned. Cutting of woody spouts increased herbaceous species cover, but regardless of treatment there was a tendency for succession toward shrub dominated communities. Planted conifers consistently established regardless of treatment. Alternative reforestation treatments had differential influences on initial vegetation developmental trajectories. The effectiveness of conifer planting to meet restoration objectives will emerge with further monitoring.

Anderson, Rick

As a sixth-generation Floridian, Rick has deep ties to the Florida Peninsula. He has inherited the craft of woods-burning from his ancestors. Rick's professional work began with the Florida Division of Forestry in 1976. In 1980 Rick went on to serve in several National Park areas which included Yellowstone, Olympic, Saguaro and Everglades. While at these suprilative national treasures, he become adept at planning fire treatments in designated Wilderness and the habitats of federally listed species as well as urban interface. Rick also served as an FMO for The Nature Conservancy in the Southeastern US, Bahamas and Belize. In 2004 Rick became the fire ecologist for Everglades National Park, before being promoted to FMO in 2008. He is currently a Division Supervisor on the Southern Area Red Team, a Type 1 Burn Boss and an Type 3 Incidentt Commander. Rick is a graduate of the University of Montana, School of Forestry.

Oral presentation, Wednesday, 3:25 PM, B116

The River of Fire Fire Management in the Modern Everglades

The River of Fire: Fire Management in the Modern Everglades Rick Anderson, National Park Service Homestead Florida Fire is often cited as an important ecological process within the Everglades National Park. However, much of the emphasis of everglades restoration external to the National Park is focused on "getting the water right" with fire relegated to an epiphenomenal role. Restoration efforts rarely propose fire management strategies. This may be in part because of a collective assumption that in a restored, and thus wet ecosystem that unwanted fire effects will cease to exist. Like water flow the landscape level fire process has been compartmentalized and constrained by water management structures, roads, exotic species, and human populations. Further endangered species, particularly the single species approach, created by the endangered species act creates a complicated matrix of regulations and often conflicting objectives for fire managers. Presented here are the challenges that fire managers encounter and proposed solutions such as applying Fire Return Interval Departure methods. Prioritization methods will also be discussed as applications that guide managers through decision making.   Rick Anderson Fire Management Officer, National Park Service Everglades National Park 40001 State Road 9336 Homestead Florida 33034 USA phone 305.242.7853 email Rick_Anderson@nps.gov

Andrews, Garren

Garren M. Andrews Graduate Research Assistant California Polytechnic State University, San Luis Obispo Master of Science in Forestry Sciences candidate

Oral presentation, Wednesday, 4:40 PM, C121

Post-fire Response in a Coast redwood/ Douglas-fir forest, Santa Cruz Mountains, California

We investigated how fire severity impacts the survival and response (sprouting/seeding) of multiple species in the Santa Cruz Mountains of coastal California, including coast redwood (Sequoia sempervirens), Douglas-fir (Pseudotsuga menziesii), tanoak (Lithocarpus densiflorus), and Pacific madrone(Arbutus menziesii). During August 2009 the Lockheed fire burned nearly 3,160ha of mixed-conifer stands with variable severity. Data from 37 Continuous Forest Inventory (CFI) plots were collected immediately before and for 2 successive years following the 2009 Lockheed Fire.   This research entails two objectives. First, we quantified post-fire mortality of trees that vary in species, size, and fire severity. Second, we developed logistic regression models that predict post-fire mortality for Coast redwood, Douglas-fir and Tanoak. Understanding the relationship between burn severity and mortality can allow for better post-fire predictive services. This research can support forest managers in determining the best management practices to facilitate long-term sustainability and protection of environmental infrastructure within Coast redwood/Douglas-fir forests.

Arnold, James

James Arnold is a Masters Candidate and Research Assistant in the University of Utah Geography Department. His work in the Utah Remote Sensing Applications Lab involves modeling fire conditions in the Western United States using antecedent climate conditions.

Oral presentation, Tuesday, 2:30 PM, B113

Modeling fire conditions in the western United States using antecedent climate

The Great Basin and Upper Colorado River Basin of the Western United States possess complex topography and varied fire ecology. The specific precipitation and temperature patterns present in the months prior to wildfire events in this region are poorly understood. This study used antecedent climate patterns to identify the conditions prior to fire occurrence and to construct a model of fire risk and severity for the Interior Western United States. Data from the Monitoring Trends in Burn Severity (MTBS) dataset spanning a period from 1984 to 2009 were used to understand spatial and temporal patterns in fire. PRISM data were used to represent climatic conditions across the study area during this time period, based on monthly maximum temperature, precipitation and drought severity. These data revealed five unique fire-climate patterns which exist within the region; three of the patterns are characterized by predominantly dry conditions and two by predominantly wet conditions present during the months prior to a fire. The frequency and occurrence of these patterns appear strongly linked to regional drought severity over the study period. Maximum entropy modeling was used to characterize the spatial patterns of fire-climate classes and predict future fire conditions. A test dataset of fires which occurred within the study region during 2010 were predicted with an average Area Under Curve (AUC) score of 0.93. The resulting models demonstrate the ability to predict fire risk and potential burn severity within the Interior Western U.S. taking into account current and antecedent climate information.

Arsenault, André

André Arsenault, Forest Ecologist, Canadian Forest Service. I am fascinated by forest ecosystems, science, and how society uses information to manage forests. I had the great priviledge to work on high priority forest management issues in a wide variety of forest ecosystems from British Columbia to Newfoundland. André's current research projects include the study of forest dynamics and disturbance in coniferous forests of Newfoundland and Labrador along latitude and elevation gradients, ecosystem response following different multidisciplinary silviculture systems experiments in British Columbia and in Newfoundland, distribution ecology of arboreal lichens in British Columbia and Newfoundland, and historical dynamics and disturbance history of dry forests ecosystems of western North America. Recent accomplishments include a book on inland rainforests, co-editor of a special issue of Forest Ecology and Management on forest biodiversity, and a number of manuscripts that challenge conventional wisdom on fire ecology and management of dry forests.

Oral presentation, Tuesday, 4:15 PM, B112

Spatial and temporal patterns of fire history and vegetation of dry forests along an elevation gradient in the Arrowstone valley, southern British Columbia.

Fire has been an important process in shaping the dry Douglas-fir forests of British Columbia's southern interior. However the spatial and temporal patterns of fire regimes and how they are linked to vegetation and climate have not been investigated thoroughly. We document the spatio-temporal pattern of fire history along an elevation gradient in the Arrowstone, valley. The study area is a 6700 ha protected watershed which has experienced only limited human intervention. Interior Douglas-fir occurs throughout the study area while Lodgepole pine dominates at higher elevations. Ponderosa pine occurs on drier sites and tends to be more abundant at lower elevations. Hybrid white spruce and trembling aspen are associated with wetter microsites. Fire history, forest structure and vegetation were assessed in 90 plots located along five 2km gradsects distributed in different parts of the watershed to capture variation in elevation and topography. A fire chronology was constructed from 143 fire scar samples and spanned a period from 1585 to 2006. Tree ages collected from over 700 tree cores ranged from 30 to 500 years. Additional cores were collected from this valley and nearby Hat Creek to construct a long chronology from 1312 to 2006 which exhibited clear drought patterns associated with high fire years. Historically the landscape was in a state of non-equilibrium with fires of variable size, severity, and frequency. Fire protection records from the BC Forest Service reveals little fire suppression activities in the watershed suggesting that a lengthening of fire intervals for portions of the watersheds are most likely related to changes in climate. Episodic catastrophic fire and insect disturbances have played a major role in shaping the structure and composition of these forests reinforcing the idea that interior Douglas-fir forests are characterized by complex mixed-severity disturbance regimes rather than by a fire maintained equilibrium.

Bailey, John

John Bailey, Associate Professor of Silviculture and Fire Management at Oregon State University's College of Forestry. I've been at OSU since 2006 after nine years at Northern Arizona University. I've developed many of the current fire courses at OSU and revised the Forest Management curriculum in recent years. Most importantly, I advise the OSU pyromaniacs!

Oral presentation, Wednesday, 11:00 AM, B118

Scaling Up Our Understanding of Fire Risk and Fuels Management

Too much of our current debate about fire risk and fuels management takes place at insignificant temporal and spatial scales. In fact, temporal patterns are commonly ignored though they are equally important to spatial ones given predictable rates of fuel accumulation and structural change. Because fire risk changes over time, the optimal spatial allocation of fuels treatment in a single year must depend on temporal change in that risk. But, given operational limitations, agencies allocate fuels/silvicultural prescriptions to a limited number of stands each year, over relatively small areas, due to budget and workforce constraints. It is unrealistic to assume that managers could truly account for all the issues and how they change in time and space. However, there are some basic patterns and realities for which we should all account in our land management. Oregon State University scientists have analyzed the optimal spatial allocations of fuels treatment over time by explicitly varying and modeling temporal dynamics and decisions – the timing and intensity of re-entry for fuels treatments – relative to spatial patterns. We have a range of projects examining both the mechanics and impacts of these dynamics and decisions, as well as the influence of market economics, social networks, climate change/variability, and other disturbance agents in forest and woodland ecosystems. Four basic rules emerge from this and others' research: 1) wildland fire is a growing reality and cannot be excluded from ecosystems any more than humans or exotic species; 2) fire behavior is imminently predictable at the smallest scales but unpredictable at the largest – and we manage landscapes in between these two extremes; 3) given a shortage in predictability and control, we must relax our expectations and conservatively build resistance and resilience into ecosystems; and 4) wildland fire can actually be a partner in that process.

Bakker, Jonathan

Dr. Jon Bakker is an Associate Professor in the School of Environmental and Forest Sciences at the University of Washington. His research focuses on the restoration and management of ecosystems, plant community dynamics, and quantitative techniques for ecologists.

Oral presentation, Thursday, 1:40 PM, B115

Fire effects in sagebrush and prairie communities

Disturbances such as fire can negatively affect the abundance of some plant species yet positively affect the abundance of others; the net effect depends on the balance between these counteracting effects. In this presentation, we summarize two studies examining vegetation responses to fire. One study occurred in the sagebrush steppe of eastern Washington, where wildfires are increasingly common in recent decades. We analyzed data from baseline surveys of permanent vegetation transects in 1996, and from remeasurements of those transects two years following a wildfire in 2000 and two years following a wildfire in 2007. We used these data to describe how the fires, and subsequent postfire restoration efforts, affected successional pathways. Plant communities differed in response to repeated fire and restoration, and these differences could largely be ascribed to the functional traits of the dominant species. Low elevation communities, previously dominated by obligate seeders, moved furthest from their initial composition and were dominated by weedy, early-successional species in 2009. Higher elevation sites with resprouting shrubs, native bunchgrasses, and few invasive species were generally more resilient to the effects of repeated disturbances. We propose a state and transition model with two axes (shrub/grass and native/invasive abundance) that also accounts for differences in plant functional traits and disturbance regimes. The other study occurred in the prairies of western Washington, where prescribed fire is a common site preparation treatment. We compared prescribed fire with two other treatments, solarization and repeated herbicide applications, in terms of its effectiveness in controlling invasive species and enabling sown native species to establish. This study was replicated at 4 sites and in 3 years, for a total of 10 site-year combinations. The results highlight the spatial heterogeneity and context-dependence of fire effects.

Balice, Randy

Dr. Randy Balice, Principal Scientist and owner of Rayo Montano Consultants, came to Los Alamos in 1995 and began a fire hazard assessment program at the Los Alamos National Laboratory that was a cornerstone of successful fire management in the region. Dr. Balice started his career as a summer technician for the US Forest Service in 1975. Inspired by this

experience, he completed a MS degree in Geography, from the University of Utah, in 1980 and a PhD in Forestry, from the University of Idaho, in 1990. Before his arrival in Los Alamos, Dr. Balice gained experience in a variety of professional capacities throughout the western United States.

Oral presentation, Thursday, 1:15 PM, C126

Hot-drought impacts to compositions and fire hazards of forests and woodlands in the Southwest US

The combination of drought and elevated temperatures, which occurred in the Southwest US between 1998 and 2004, caused hot-drought conditions that contributed to widespread tree mortality. This was previously demonstrated for piñon (Pinus edulis). Here we use long-term data from the eastern Jemez Mountains, New Mexico, to extend these results to ponderosa pine (Pinus ponderosa) forests, mixed conifer forests and spruce-fir forests, as well as to other woodland tree species. We also examine mortality trends with respect to their potential impacts on fire hazards.   Some species and vegetation types suffered greater hot-drought mortality than others. For instance, piñon mortality was approximately 96 percent for all trees greater than ten feet tall. On the other hand, one-seed juniper (Juniperus monosperma) and aspen (Populus tremuloides) experienced very little mortality. Other tree species showed intermediate levels of mortality. Also, tree mortality decreased from low to high elevations in the study area. For ponderosa pine forests, fire hazards were reduced by this mortality event. Although these fire-hazard reductions are significant and helpful, they are not sufficient to completely replace mechanical thinning as a form of fire hazard reduction.

Banwell, Erin

Erin Banwell is a Forest/Fire Ecologist at Sonoma Technology, Inc. located in Petaluma, California. She is currently involved with scientific testing, design, and training related to several fire and fuels related projects, including the Interagency Fuels Treatment Decision Support System (IFTDSS) and BlueSky Playground. For her thesis work at Humboldt State University, she conducted field and laboratory research on forest floor characteristics in long-unburned Jeffrey Pine–white fir forests of the Lake Tahoe Basin, where she focused primarily on small-scale spatial variations in forest floor moisture and bulk density.

Oral presentation, Thursday, 11:25 AM, C122

BlueSky Playground: A Web-Based Smoke Modeling Decision Support Tool

Fire exclusion across the United States is a major contributor to wide-scale changes in forest structure, alterations in species composition, and accumulation of forest floor material. Fuels treatments, including prescribed fires and pile burns, have become increasingly important as fire seasons continue to worsen in severity. In addition, standards for particulate pollution continue to tighten, requiring land managers that approve or conduct prescribed fires to manage smoke production carefully to minimize smoke impacts in sensitive areas.   BlueSky Playground is an interactive, web-based tool for estimating smoke emissions and resulting downwind smoke concentrations from wildfires, prescribed fires, and pile burns. It connects to fuel loading, fuel consumption, fire emissions, and smoke dispersion models within the BlueSky Framework, providing access to powerful modeling tools in an easy-to-use interface. BlueSky Playground is part of the Wildland Fire Decision Support System Air Quality suite (WFDSS-AQ) and has been expanded recently to provide more useful tools for prescribed burn planning, including high-resolution forecast meteorology to assist in making go/no-go decisions. In this presentation, we show how BlueSky Playground can be used in both wildfire and prescribed fire analyses.

Barnes, Jennifer

Jennifer has worked as the Regional Fire Ecologist for National Park Service, Alaska since 2002. She started working in fire in 1989 with the Forest Service in Montana. She received her M.S. in Biology-Plant Ecology from Utah State University and her B.S. in Biology/Chemistry from the University of Montana, Missoula. She co-authored some of the first work on remote sensed burn severity in Alaska.

Oral presentation, Wednesday, 2:30 PM, C120

Tundra fires in northwestern Alaska: potential impacts of burn severity on vegetation and soil carbon storage

Tundra fires in Noatak National Preserve in Alaska often burn into the organic soil material which can impact vegetation succession and have the potential to release ancient stored carbon. The objectives of this study were to: (1) assess burn severity and effects on vegetation, and (2) investigate how burn severity and fire return intervals influence the release of carbon from tundra soils. For the five fires assessed in Noatak NP, the MTBS burn severity maps indicated that 76% of the area was classified as unburned to low severity, 17% was moderate and only 1 % of the area was high severity. Comparing

the ground based severity data at 34 plots, the initial assessment remote sensed data had a stronger correlation (r2 = 0.86) than the mixed assessment data of MTBS (r2 = 0.70).   Low to moderate severity sites showed a rapid recovery of tussocks (Eriophoroum vaginatum) and initial re-sprouting of common ericaceous species one year post fire.   To assess the impacts of tundra burning on carbon cycling, 24 soil monoliths were collected within and outside the fires that had varying burn severity for radiocarbon analysis.   The 14C ages of individual charcoal particles indicate that the 2010 burns consumed biomass that was less than 60 years old.   Given that fire return intervals are generally greater than 60 years based on paleo-records from the region, the carbon released is expected to recover though vegetation succession.   Compared to low or un-burned sites, the basal 14C ages at similar depths are consistently older from high-severity burns or areas that have burned more than once over the past 60 years.   Specifically, at severe burns or in areas with multiple burns over the past 60 years, organic matter at 15-20 cm below the soil surface has the age range of 800-11 AM years.   In contrast, soil organic matter at similar depths at unburned and low-severity sites was less than 200 years old.   This contrast implies that the tundra soil carbon that has accumulated over the geological past is vulnerable to increases in fire frequency and severity in response to climatic warming.

Barnett, Kevin

Kevin Barnett received his BA in Economics in 2010 and is currently finishing a MS in Forestry, both at The University of Montana.   His research interests are in natural resource and environmental economics, with a focus on integrating spatial and economic analysis techniques.

Oral presentation, Tuesday, 2:30 PM, C121

Economic Evaluation of Alternative Wildfire Management Strategies

Contemporary wildfire management policy requires managers to make tradeoffs between expected suppression expenditures, risk to firefighter and public safety, suppression effectiveness, and protection of market and non-market resources at risk when choosing an appropriate management response.   Evaluating alternative management strategies is challenging because of the inherent uncertainties in predicting future wildfire spread and behavior, limited evidence of suppression effectiveness, and the dearth of accurate resource value change estimates due to wildfire.   However, recent advancement in comparative wildfire risk assessment has enabled researchers to account for these uncertainties to investigate how alternative wildfire and fuels management decisions affect wildfire risk.   The objective of this study is to economically evaluate initial attack suppress/no-suppress decisions on the basis of expected effects to four resources at risk: public and private structures, Canada lynx habitat, merchantable timber, and public expenditures on wildfire suppression.   The Bob Marshall Wilderness Complex (BMWC) located in western Montana was selected as the study area because of its broad range of resources at risk and rich history of wildland fire use.   Wildfire burn probability and intensity information was derived for the BMWC using the Large Fire Simulator (FSim) under two landscape conditions: (a) actual fuels given successful suppression of lightning ignitions in 2007 and 2008; and (b) hypothetical fuels developed by retrospectively simulating wildfire spread and behavior for 37 successfully suppressed ignitions during 2007 and 2008 using FARSITE under a 'let burn' management strategy and updating fuels accordingly.   Expected net value change was calculated by translating fire effects to expected quantity change of resources at risk through response functions, multiplying the expected quantity change by per unit resource value estimates, and subtracting predicted suppression costs.   We compared expected net value change under both management scenarios and explored the strengths and weaknesses of our economic evaluation framework.

Bates, Jon

Jon D. Bates, Rangeland Ecologist, USDA-ARS   Jon Bates is a rangeland ecologist with USDA-ARS at the Northern Great Basin Agricultural Research Center were his studies focus on post-disturbanceecology in sagebrush steppe and juniper woodlands.

Oral presentation, Tuesday, 4:15 PM, C120

Vegetation Response to Fuel Reduction Methods in the Control of Western Juniper

The expansion of piñon-juniper woodlands the past 100 years in the western United States has resulted in large scale efforts to remove trees and recover sagebrush steppe rangelands.   It is important to evaluate vegetation response in order to develop best management practices for controlling expanding woodlands.   In this study, we compared three treatments used to control western juniper in the northwestern United States; cut and leave, cut and broadcast burn, and cut-pile and burn. The study was located in a Ponderosa pine-curl leaf mahogany/mountain big sagebrush-Idaho fescue association in eastern Oregon. In the broadcast burn treatment there was increased bare ground, lower litter cover, lower cover and

density of Sandberg's bluegrass, lower cover of perennial bunchgrasses, greater cheatgrass cover, lower density and cover of mahogany, lower juniper density, and greater rubber rabbitbrush density compared to the pile-burn and cut-leave treatments. In the broadcast burn treatment juniper density was about 25% of the pretreatment density of 400 trees/ha 4 years after juniper control. In pile-burn and cut-leave treatments juniper density was about 30% of pretreatment densities. To prolong desired vegetation conditions, follow up management will be necessary to control juniper re-establishment. To encourage recovery of curl-leaf mahogany our results indicate that mechanical methods and pile burning provide the best management alternative as broadcast fire reduced mahogany presence. The increase in perennial bunchgrass density and cover makes it unlikely that cheatgrass will persist as a major understory component in areas similar to where the juniper treatments were applied.

Batllori, Enric

I'm Enric Batllori, currently a postdoctoral researcher in the Department of Environmental Science, Policy and Management at the University of California Berkeley. With a forest ecology background, I am broadly interested on ecosystem responses to disturbance under global change and its potential effects on landscape structure at multiple temporal and spatial scales.

Oral presentation, Tuesday, 11:00 AM, B114

Quantifying the environmental space occupied by wilderness areas to improve our understanding of natural and altered fire regimes

Wilderness areas (WAs) represent an important extreme on the land management spectrum and are particularly valuable benchmarks for understanding fire ecology relative to more manipulated lands. Less suppression and intervention occurs on wilderness fires and as a result, WAs contain the best examples of natural fire regimes. However, the degree to which wilderness fire regimes have been altered through management is not well known, nor is it known whether fire regimes in WAs are different because of protection status or because of environmental conditions. As a prerequisite to fully understand alterations in wilderness fire regimes, we conducted a comprehensive characterization of the environmental space occupied by the WAs in the conterminous US. To define the environmental space of WAs, independent from their geographic space, we used ordination techniques to obtain a reduced set of axes of variation on the basis of multiple climatic and other physical factors (e.g., remoteness, topography). We subsequently divided the obtained space into homogeneous units to assess both the representativeness and coverage of the WA network. Finally, we evaluated the consistency of continental-wide versus regionalized approaches. We found that the WA network represents the environmental space of the USA well at a continental scale. However, the environmental characterization was very sensitive to scale, and at the regional level we identified environments currently underrepresented by the WA network. Our next step will be to add fire metrics to the characterization so that we can assess departures of fire regimes in WAs from what their environmental space would suggest. Specifically, we intend to evaluate the partial dependence of fire to climatic and other variables throughout the regionalized space. While our results have obvious implications for conservation priorities, our framework offers a powerful new perspective for identifying common vulnerabilities, and new insights for managing WAs as a network.

Battaglia, Mike

Mike Battaglia is a Research Forester at the USFS Rocky Mountain Research Station in Fort Collins. His research focuses on developing and implementing innovative management strategies that address the challenges and issues faced by forest managers including forest restoration, fuels mitigation, and forest resilience across multiple spatial scales.

Oral presentation, Thursday, 1:15 PM, B111

Fuel moisture dynamics across developmental stages of Northern Rockies forests

Fuel moisture plays an important role in determining fire behavior. Herbaceous, shrub, and woody fuel moistures influence surface fire behavior by determining if these fuels will act as a heat sink or source. Foliar moisture influences the amount of heat energy required to initiate a crown fire. Forests of different developmental stages consist of various combinations of tree species, densities, and canopy openings. These different developmental stages in turn influence the types and arrangement of fuels available to burn and the fuel moisture of these fuels. A better understanding of how forest structure and composition influence fuel moisture dynamics can inform managers of potential fuel complexes that can maintain higher fuel moistures later into the fire season. In this study, we monitored moisture of tree seedlings, shrubs, herbaceous plants, woody fuels, litter, duff, and soils over the 2011 growing season in various development stages of mixed conifer forests of the Northern Rockies at the Priest River Experimental Forest. Our intent is to quantify the temporal changes in fuel

moisture for each fuel strata in relation to the forest developmental stage. This information will be linked with concurrent studies that are currently quantifying heterogeneity from the site to landscape with the ultimate goal of investigating the role that landscape heterogeneity of forests can enhance landscape resiliency to wildfire.

Beierle, Micah-John

Micah-John Beierle is a Research Associate with the Department of Natural Resources Management, Texas Tech University (Texas Tech University - MS 42125 – Lubbock, Texas 79409; Phone: 806-742-3542; e-mail: micah-john.beierle@ttu.edu). Micah's most recent research includes his thesis entitled 'Biophysical and Human Characteristics of Wildfire Ignition in the Shortgrass Prairie Region of Texas' and 'Best Practices for TxDOT on Handling Wildfires'.

Oral presentation, Thursday, 11:25 AM, C120

Shortgrass Prairie, Texas: A new fire season

Because of an increase in wildfire activity in Texas over the past five years understanding when wildfires are most likely to occur has become very important. Changes in the statewide wildfire reporting system in the past decade have allowed increased reporting in Texas, resulting in greater ability to predict when and where wildfires may occur. The aim of this project was to determine the temporal variability of reported wildfires and reported wildfire causes in the shortgrass prairie region of the Southern Great Plains in Texas. Reported wildfire seasonality for all reported wildfires and by cause class were assessed by comparing months with respect to number and size of reported wildfires. Eighty-five percent of the total reported area burned from 01/01/2001 to 12/31/2010 burned during the months of January through June. January through March had the most reported wildfires while August through October had the fewest reported wildfires. The study indicates human causes now contribute to a year-round fire season while natural wildfires occur only during drier, warmer periods of the year. Of the known reported wildfire causes, humans caused 79% of reported wildfires in the shortgrass prairie region of Texas. Of this 79%, three categories were most common. These three categories were equipment use related (36%), debris burning (24%), and smoking (10%).

Belote, Travis

Travis Belote is a research ecologist in the Northern Rockies office of The Wilderness Society. He studies the factors that govern biodiversity, community composition and structure, and ecosystem function and works to bridge the gap between ecological theory and application of science to pressing conservation challenges. He works with local and regional collaborative groups to design and monitor forest restoration projects in the Crown of the Continent, Montana.

Oral presentation, Tuesday, 1:40 PM, B114

Wilderness as a reference for restoration: can burned western larch forests in the Bob Marshall Wilderness serve as models for cross-scale restoration targets in mixed-severity fire regimes?

Fire suppression and timber harvesting have altered forest structure and function across the Intermountain West. To correct for these effects, managers have made tremendous investments in landscape restoration programs throughout the region. For many western forests, historical conditions that could inform restoration targets are unknown, and comparable, unaltered reference sites where fire has been largely unsuppressed or where active fire regimes have resumed do not exist. Restoration efforts in the Crown of the Continent ecosystem in northwest Montana, however, are aided by proximity to the Bob Marshall Wilderness (BMW), where, for the past few decades, many fires have been allowed to burn for their ecological benefits. Because much of the BMW landscape is composed of forests with highly variable fire frequencies and severities, fire effects at both stand and landscape scales may still be within their historical range of variability and may serve as reference sites for restoration. To quantify patterns that could serve as references for restoration, we sampled old-growth larch forests along the South Fork of the Flathead River in the BMW that burned in 2000 or 2003 to determine how recent fires influenced forest composition and structure at stand and landscape scales. We assessed the effects of fire by comparing current post-fire conditions to reconstructed pre-fire conditions, and related field measurements to satellite-based metrics of burn severity. Fire created spatially heterogeneous stand and landscape conditions, and severity depended largely on species composition. We will discuss opportunities and cautions for applying findings to restoration, and discuss whether and when Wilderness may serve as a reasonable reference for restoration.

Beyers, Jan

Jan L. Beyers is a research plant ecologist with the USDA Forest Service's Pacific Southwest Research Station in Riverside, California. She has a bachelor's degree in Environmental Studies-Biology from Whitman College and a Ph.D. in Botany

from Duke University. Her Forest Service research focuses on the effectiveness of postfire emergency watershed stabilization treatments, ranging from grass seeding to aerial hydromulch, and on fire ecology of chaparral and related plant communities. A 2004 review of grass seeding effectiveness stimulated considerable valuable new research on that topic, resulting in better information for land managers and BAER teams.

Oral presentation, Tuesday, 11:25 AM, C120

Impact of Post-fire Mulches on Chaparral Vegetation Recovery in Southern California

Post-fire erosion and sediment movement threaten homes, highways and other high-value assets after chaparral wildfires in southern California. Aerially-applied hydromulch is often used to protect these values in areas where fall and winter winds would blow less-expensive straw mulch away. Public concern is high over the impact of hydromulch on native vegetation recovery, especially seedlings of shrub species killed by fire and the diverse native annual plants that grow only in the high light environment produced by wildfire. We examined post-fire vegetation development after three urban-interface fires that were treated with aerial hydromulch; in addition, we tested alternative mulch materials – wood shreds and wood straw – on two of the burned areas. All sites were in coastal mountain ranges. Vegetation recovery was assessed at the end of the spring growing season in 1-m2 plots, associated with silt fences used in concurrent erosion studies, for three years on each site. Total plant cover, shrub seedling density, and species richness were unaffected by any of the mulches, although first-year herbaceous cover trended higher in mulch plots at two of the sites. Pre-fire vegetation composition, apparent seed bank contents, and post-fire rainfall influenced plant abundance more than the hydromulch or other treatments. Except at one site when it experienced an extreme high-intensity rainfall event, the mulches reduced hillslope sediment movement compared to controls (see separate presentation). Hydromulch is expensive to apply with aircraft, approximately $4,000 per acre. Where values at risk justify its use, aerial hydromulch can be a useful post-fire stabilization treatment in coastal southern California that doesn't affect chaparral recovery. Wood shreds could potentially provide longer-lasting soil protection – beneficial when vegetation recovery is slow due to low rainfall – but more research is needed on the soil effects of off-site carbon addition.

Bigio, Erica

Erica Bigio, Graduate Research Associate Laboratory of Tree-Ring Research University of Arizona I am a PhD student with the Laboratory of Tree-Ring Research and the Geosciences department at the University of Arizona. I do research on fire history using tree-ring and alluvial sediment methods. One publication on this type of research from my Masters' degree is: Bigio, E.R., Swetnam, T.W., and C.H. Baisan, 2010, A Comparison and Integration of Tree-Ring and Alluvial Records of Fire History at the Missionary Ridge Fire, Durango, Colorado, USA. The Holocene 20(7): 1047 – 1061. I look forward to the AFE conference in Portland, and I am interested in learning more about GIS applications and landscape patterns in fire ecology research.

Oral presentation, Tuesday, 2:05 PM, B113

A Fire History Reconstruction of the Western San Juan Mountains: Results from tree-ring and alluvial sediment methods

In 2002, the Missionary Ridge Fire burned several tributary watersheds along three main valleys of the western San Juan Mountains near Durango, Colorado. Post-fire debris flows and flooding incised tributary channels and alluvial fan deposits and created exposures of older alluvial sediment deposits. When sediment deposits contain charcoal, they may be used to represent past fire events in each contributing basin. Fire-related sediment deposits were sampled from several exposures within the upland tributary channels and alluvial fans. The ages of all fire-related deposits range from ~4,000 calendar years before present (cal yr bp) to present with periods of increased fire activity occurring between 2,500 – 2,100 cal yr bp, 1,100 – 900 cal yr bp and 600 – 300 cal yr bp . Furthermore, the severity of fire events can be inferred from sediment characteristics. In this case, low-severity fire events are inferred from fine-grained, fluvial deposits, while high-severity fires are inferred from charcoal-rich debris flow deposits. Evidence of both low and high severity fires occurred equally over the study period and the dominance of one fire regime is not clearly observed. Tree-ring material was collected from three tributary watersheds and is composed of both fire-scarred trees and age-structure data. Fire-scar dates indicate that low-severity fires occurred approximately every 20 – 30 years on south-facing slopes, while age-structure data suggests that some north-facing slopes may have experienced high-severity fire within the past 300 years. Age-structure data shows continuous regeneration over 500 years on south-facing slopes with recent, even-aged stands located on north-facing slopes. The combination of these two proxies provides a combined fire history record, which can be compared with paleoclimate records to identify climate drivers of fire activity. Preliminary analysis suggests that rapid transitions between wet/dry periods create fuels to support high-severity fire, while also providing rainfall for runoff events to follow fires.

Bird, Douglas

Douglas Bird is a Senior Research Scientist at Stanford University's Bill Lane Center for the American West and the Department of Anthropology. He works on issues of subsistence strategies and land use in Indigenous communities in Australia's Western Desert. He has written widely in venues such as the Proceedings of the National Academy of Sciences on links between Indigenous foraging practices and fire ecology in arid Australia.

Oral presentation, Tuesday, 2:05 PM, B118

Aboriginal Australians as trophic regulators: fire, hunting, and small mammal extinctions in the Western Desert of Australia.

Australia is currently witnessing the ever increasing effects of devastating wildfires linked increasingly variable and unpredictable climate cycles, along with the world's most significant decline of endemic mammals. Here we present data illustrating how contemporary Martu foragers, Traditional Owners of a large region of Australia's Western Desert, serve as trophic regulators and apex predators, both in their hunting of mesopredator populations (varanids and feral cats) and in their fire-mediated disturbance of plant communities. With the loss and persecution of Aboriginal populations in the desert regions between 1920 and 1965, the combination of periodically extensive wildfires and increases in mesopredator populations resulted in hyperpredation that caused small mammal populations to crash. We find evidence of regulatory effects on mesopredator populations, increased availability and diversity of habitat niches that favor endemic mammals, and reduced climate-related variability in fire size and severity in landscapes where Martu frequently hunt and burn compared to landscapes dominated by a climate-driven fire regime.

Blankenship, Kori

Kori Blankenship is a fire ecologist with The Nature Conservancy. Kori has worked on the LANDFIRE project since 2004 as a member of the mapping team and the vegetation modeling team. Her current focus is applying LANDFIRE tools and data to solve conservation and land managment problems.

Oral presentation, Wednesday, 2:30 PM, B110

LANDFIRE Fire Regime Products

LANDFIRE fire regime products characterize reference fire frequency and severity and vegetation departure for the entire U.S. The datasets in this product suite include Biophysical Settings, Succession Class, Fire Regime Group, Mean Fire Return Interval, Reference Fire Severity, Vegetation Departure and Vegetation Condition Class. These products support fire and landscape management planning goals specified in the National Cohesive Wildland Fire Management Strategy, the Federal Wildland Fire Management Policy and the Healthy Forests Restoration Act. This presentation will describe the fire regime products, their development and how they have evolved over time. Considerations for the use of these products in fire management applications will be discussed.

Blankenship, Kori

(See biographical information, above.)

Oral presentation, Wednesday, 4:15 PM, B110

LANDFIRE Biophysical Setting Maps and Models, The LANDFIRE product suite includes a set of aspatial, quantitative, ecological models that describe vegetation and disturbance dynamics for every Biophysical Setting (BpS) mapped by LANDFIRE. The models were developed by more than 700 experts through a series of workshops and meetings held around the country organized and supported by LANDFIRE. The creation of the LANDFIRE model set represents a significant contribution to the understanding and synthesis of information related to pre-settlement ecosystems in the U.S. In addition to their use in understanding and setting reference conditions, the models can be adapted to represent current or desired conditions, to predict future conditions and to test land management strategies. This presentation will explain the LANDFIRE BpS models and their use in LANDFIRE, as well as demonstrate the utility of the models in fire management applications.

Booth, Emily

Emily Booth is a second-year Ph.D. student at the University of Texas at Austin. She received her M.S. degree from Northwestern University and the Chicago Botanic Garden. Her Ph.D. dissertation research is an investigation of the effects of wildfire and restoration treatments in the Lost Pines region of central Texas, and bridges her interests in fire ecology, conservation biology, and species distribution modeling. She is working to form a new chapter of SAFE for the University of Texas at Austin and central Texas.

Oral presentation, Tuesday, 3:25 PM, C126

Effects of pre-wildfire prescribed burns, wildfire intensity, and post-wildfire management on plant regeneration in the Lost Pines of Texas

The Lost Pines of central Texas are the westernmost stands of loblolly pine (Pinus taeda) in the United States. They support a diverse native plant community and are the habitat of the endangered Houston toad. In September 2011, catastrophic wildfires burned much of the Lost Pines during a record drought, which together killed most of the trees in many parts of the Lost Pines, including Bastrop State Park. Other effects of the wildfire and drought likely include increased erosion rates, increased abundances of invasive plant species, and changes in plant community composition and structure. In collaboration with Texas Parks and Wildlife staff, we are investigating how post-wildfire plant communities are affected by (1) pre-wildfire conditions, including prescribed fires, (2) wildfire intensity and spatial patterns, and (3) post-wildfire management actions, including hydromulch reseeding with sterile grasses. Permanent plots established using FIREMON protocols, both before the 2011 wildfire and in summer 2012, were used for data collection. In much of the Park, yaupon (Ilex vomitoria) and pine needle drape caused plots to be heavily burned. In these plots, all size classes of pine trees were killed and litter and duff layers were burned. However, some oaks (primarily Quercus marilandica and Q. margaretta) are re-sprouting in these plots. In summer 2012, loblolly regeneration was greater in plots that were scorched to moderately burned by the 2011 wildfires, had a pre-wildfire prescribed burn, or both, than it was in either heavily burned or unburned plots. The absence of pine seedlings in heavily burned plots may be due to seed shortage, unsuitable seed beds, or both. Unburned plots appear to have too much shade for pine seedlings, in part from yaupon. Hydromulching appears to have suppressed understory pine regeneration and herbaceous species.

Bourgeron, Patrick

Patrick. Bourgeron is a senior research scientist at the Institute of Arctic and Alpine Research of the University of Colorado at Boulder. Over the years, he has worked in academia, a science museum, and a non-governmental organization. He has held 31 special project appointments, served on over 35 panels for US federal and foreign government agencies, and has acted as a science adviser or expert to US and foreign land managers, decision-makers, and regulators. His various activities in 53 funded projects have resulted in 121 invited lectures and seminars, and produced 129 peer-reviewed publications (books, chapters, journal articles, reports, manuals, etc.) that reflect his desire to effectively inform a broad constituency, from academic researchers to senior government officials.

Oral presentation, Wednesday, 11:25 AM, B113

Dynamics of social-ecological systems in the Colorado Front Range: Fire regimes, thresholds, and stable states

Forecasting change in mountain social-ecological systems presents significant challenges, as they are likely to display non-linear responses, i.e., they are more easily pushed or "tipped" across critical thresholds. To investigate the behavior of high-elevation ecosystems in response to climate and human-induced changes and associated changes in ecosystem services, we have developed observational, experimental, and synthesis initiatives that incorporate empirical and modeling approaches to integrate complex information at the scales of Colorado Front Range social-ecological systems. First, we have implemented an integrative and iterative conceptual framework for social-ecological research for the Colorado Front Range that was formulated to explicitly integrate socio-economic and ecological disciplines via a series of broad questions.   Second, we are investigating the circumstances under which crossing a single threshold between alternative regimes often leads to a "cascading effect" in which multiple thresholds across scales of space, time, and social organization, and across ecological, social, and economic domains may be breached. Third, the impact of such changes on ecosystem structure and function – including the creation of new stable states and or novel ecosystems – extends to ecosystem services, their interactions, and trade-offs. We analyze the interactions between ecosystem services as a result of management for each of several individual ecosystem services. For example, as climate regulation has increased as a function of increasingly closed and dense forests, the capacity of landscapes to mitigate the size and intensity of disturbances has decreased. Trade-offs in ecosystem services, then, occur across space and time with different degrees of reversibility. But more than that, they often result in multiple ecosystem services being compromised for the benefit of a solitary ecosystem enhancement. We also analyze the relative change in ecosystem services since European settlement. Recreation value, for example, has increased at the expense of both water availability and natural hazard mitigation.

Bova, Anthony

Anthony Bova is a research associate at The Colorado State University Department of Forest & Rangeland Stewardship. He earned an M.S. in Environmental Engineering from the Ohio State University, where he received a NASA Fellowship, and

has over ten years of experience as a modeler and experimentalist in the fields of wildland fire, fire effects and atmospheric dispersion.

Oral presentation, Tuesday, 2:30 PM, B117

The Level Set Method as a Tool for Modeling Wildland Fire Spread

Over the past decade, the "level set" method of modeling the propagation of curvilinear fronts has been applied to diverse problems ranging from robotic navigation to finding the outline of an artery in an angiogram. A key advantage of the level set method is that, unlike so-called "marker" or "buoy" methods of front propagation, it handles the crossing and merging of separate fronts naturally, without the need for complex algorithms to untangle them. In addition, any model of heading, flanking and backing rates of spread (ROS) may be used with the method, allowing different ROS models to be compared within the same simulation framework. Thus, modeling the propagation of a wildland fire front is a natural application of the level set method. We will discuss the ongoing development and application of a level set model implemented within NIST's Wildland-Urban Interface Fire Dynamics Simulator (WFDS) model suite. Level set fire front simulations, using different ROS models, will be compared with the results of other empirical models, full-physics WFDS simulations and experimental data from grassland fires.

Brennan, Teresa

Teresa Brennan Ecologist, USGS, Sequoia and Kings Canyon Field Station   Research interests include: Fire ecology and fuels Coastal sage, chaparral and forest ecosystems Invasive species   Recent publications: 2012 Syphard, AD, JE Keeley, A Bar Massada, TJ Brennan, VC Radeloff. Housing arragement and location determine the likelihood of housing loss due to wildfire. PLoS ONE 7(3): e33954.   2012 Keeley, JE, TJ Brennan. 2012. Fire-driven alien invasion in a fire-adapted eco-system. Oecologia 69(4): 1043-1052.   2011 Syphard, Alexandra D., Jon E. Keeley, and Teresa J. Brennan. 2011. Comparing the role of fuel breaks across southern California national forests. Forest Ecology and Management 261:2038-2048.   2011 Syphard, A.D., J.E. Keeley and T.J. Brennan. 2011. Factors affecting fuel break effectiveness in the control of large fires on the Los Padres National Forest, California. International Journal of Wildland Fire 20:764-775.

Oral presentation, Tuesday, 4:40 PM, B116

Effectiveness and Effects of Mastication Fuel Treatments in Non-forested Vegetation of Southern California

To date, most of our information on the effectiveness and effects of mastication treatments comes from forested ecosys-tems. In the last decade however, mastication and related mechanical treatments have been used extensively on the non-forested landscapes of southern California. Due to the extensive wildland-urban interface in the region and dangers associ-ated with prescription burning, such mechanical treatments are expected to receive even greater application in the future. This 3 year Joint Fire Science funded project is investigating both the effectiveness and effects of mastication and related mechanical treatments on the four southern California national forests. Before finalizing our study design our research team held workshops on each of the four forests to ascertain goals and concerns associated with mechanical fuel treatments with USFS fire, fuels and resource management staff. These workshops contributed significantly to identifying vegetation management goals and refining our research design. This project focuses on 1) quantifying fuel loading and fuel profiles among various treatments with and without prescribed fire 2) creating a masticated fuel photo series for non-forested fuel types 3) identifying treatment intervals for long term treatment effectiveness 4) quantifying changes in fire behavior using Behave Plus fire models and 5) evaluating the effects and impacts to soil, native and non-native plant re-colonization and shifts in community composition. To date we have quantified changes in fuels and vegetation structure and composition on 220 masticated sites in mixed-chamise chaparral dominated shrublands on the Angeles, Cleveland, Los Padres, and San Bernardino national forests. Study sites were stratified by forest, treatment type, and time since treatment. Preliminary analyses are currently underway to establish fuel loads in various masticated fuel types for the masticated fuel photo series and for use in the Behave fire models.

Brose, Patrick

Patrick H. Brose, Research Forester, USDA Forest Service, Northern Research Station   In the Northern Station, I study oak silviculture with individual projects addressing the role of prescribed fire in oak regeneration, the effect of lighting on root development of oak seedlings, the response of mountain laurel to forest management, and the fire history of eastern oak forests. I also do a considerable amount of technology transfer as I'm in heavily involved in the SILVAH – oak training session held each September at Brookville, PA as well as biennial sessions in Ohio and West Virginia.

Oral presentation, Thursday, 3:25 PM, C125

Fire Restoration Efforts on the Allegheny Plateau of Northwestern Pennsylvania

Fire has been virtually absent from the Allegheny Plateau region of northwestern Pennsylvania for nearly a century. This prolonged fire-free period has contributed to serious sustainability issues regarding the mixed-oak (Quercus spp.) forests of the region. In 2002, the Allegheny National Forest began an administrative study to examine how the reproduction of the common hardwood species would respond to the spring prescribed fires advocated by the shelterwood-burn technique. Four oak shelterwood stands were each split into two halves; an unburned control and a burn block to be treated with a spring prescribed fire. Pre-burn seedling data were collected in 2003 and 2004 and the burns conducted in May 2005. Postburn seedling data were collected in 2007. The blocks were burned a second time in May 2008 and another postburn seedling inventory was done in 2010. Before burning, these oak shelterwoods black birch (Betula lenta) and red maple (Acer rubrum) dominated the regeneration layer. After the first fires, black cherry (Prunus serotina) and northern red oak (Quercus rubra) were the dominant hardwood species in regeneration layer. The second fire caused little subsequent change to the species composition. Thes shelterwood-burn technique appears to be a good approach to overcoming the oak sustainability challenges of the Allegheny Plateau, but special allowances will probably have to be made to deal with the issues of deer overabuindance, invasive plant species, and competing resource uses.

Brose, Patrick

(See biographical information, above.)

Oral presentation, Thursday, 3:50 PM, C125

A 400-Year Fire History for the Pine Creek Gorge region of northcentral Pennsylvania

The effects of drought and human culture on the fire regimes of the central Appalachian Mountains are unclear due to the passage of time and centuries of land use. To help clarify this situation, we conducted a fire history study in the Pine Creek Valley region of north-central Pennsylvania. We collected 93 cross sections of fire-scarred red pine (Pinus resinosa) stumps and snags from three sites and analyzed them for correlations to drought and local history. We found drought had little bearing on fire regimes, but human culture had a strong relationship to fire occurrence. Prior to 1790, fires were rare. When they did occur, these fires occurred in temporal clusters separated by decades of no fire. They burned primarily during the dormant season and consisted of two types; severe, widespread fires and isolated, low-intensity fires. This reflects a low local population of American Indians, possibly due to disease or war. After 1790, fire frequency abruptly increased to 3 times a decade, but seasonality, severity, and spatial extent were largely unchanged from before 1790. This change in fire frequency corresponds with European settlement of the area. In the 1870s, fire, especially mid spring burns, became more common, coinciding with the advent of railroad logging. Timber harvesting ceased in the early 1900s and since then, fires have been nearly absent from the sites. All fire chronologies included fire-free periods that coincided with important historical events, further illustrating the pre-eminent role of local human culture in the fire regimes of these sites.

Brown, Marjie

Marjie is a wildland fire science writer and social media coach who creates 21st century communications solutions for the fire science and management community. She's written over fifty fire science publications for the Joint Fire Science Program, and manages the Firescience.Gov social media presence, blog, and email news. After making the leap from ecologist to science communications specialist about ten years ago, Mary has been disseminating science-based information to natural resource professionals and the public. She particularly enjoys creating visual media that incorporate instructional design strategies for effective learning and messaging. Mary has recently joined the Northern Rockies Fire Science Network (nrfirescience.org) and is working with scientists and managers to improve delivery and application of wildland fire science.

Oral presentation, Tuesday, 3:25 PM, B111

Delivering Your Message: Tools and Tips for Social Media and Web Media

Today's dizzying array of digital communication tools can be overwhelming. To help navigate this new frontier and strengthen your communications and outreach efforts, we'll introduce tools and tips for using social media and multimedia. We'll address how to design your message, select the right tools, and evaluate success. You'll discover the value of using diverse media to boost audience awareness and understanding of science-based information. Whether you're a manager, researcher or outreach specialist, this presentation will get your creative wheels spinning and give you some traction.

Brown, Peter

Peter M. Brown is the Director of Rocky Mountain Tree-Ring Research, a nonprofit corporation he founded in 1997. His current research involves reconstructing fire, forest, and climate dynamics in western North America and Mongolia. He is the past Director of the Annual North American Dendroecological Fieldweek, an annual workweek in applied tree-ring research, and past President of the Tree-Ring Society, an international professional society with other 350 members that publishes the journal Tree-Ring Research. He is a current or past Affiliate Faculty member at Colorado State University, University of Idaho, University of Arizona, Northern Arizona University, University of Wyoming, and West Virginia University.

Oral presentation, Tuesday, 1:40 PM, B117

Historical Forest Structure and Fire Regimes in Lower Montane Front Range Forests, Boulder County Parks and Open Space, Colorado

Lower montane forests in the Front Range of Colorado are not the same as they were before European settlement in the latter half of the 1800s. Many current forests are well outside their historical ranges of variability (HRV) in stand structures (tree basal areas, densities, sizes, and spatial patterning of trees and openings) and fire behavior. In this component of a much larger effort – the Front Range Forest Reconstruction Network – we reconstructed historical forest structures and fire histories in lower montane forests at two Boulder County Parks and Open Space (BCPOS) properties. We mapped pre-settlement tree evidence in 12 0.5-ha plots across the two properties. Also in each plot, subsamples of pre-settlement and post-settlement trees were cored for ages and fire-scar evidence was collected. Data show that this area experienced relatively frequent surface fires and patch-scale passive crown fires which, when coupled with environmental variability and other disturbances, resulted in highly diverse stand structures. However, data show that in general the historical landscape was much more open than current conditions. These data are providing guidance for ongoing ecological restoration efforts on BCPOS properties so that they will become more resilient to future disturbances such as wildfires, bark beetle outbreaks, and climate change. Furthermore, we will combine data collected on BCPOS properties with additional data from surrounding National Forest lands to develop a more complete picture of HRV in forest structure and fire regimes across the Front Range lower montane zone.

Brown, Timothy

Dr. Timothy Brown conducts research and applications development in applied climatology and meteorology, with emphasis on the application of data analysis, statistical methods and scientific visualization to atmospheric sciences and wildland fire related data. His primary academic interests include analysis of wildland fire-climate and fire-weather relationships and applications product development for wildland fire management planning, decision-making and policy, and the interface between science and decision-making. Dr. Brown is Director of the Western Regional Climate Center, and established and directs the Program for Climate, Ecosystem and Fire Applications (CEFA) at the Desert Research Institute in Reno, Nevada. He is graduate faculty in the Atmospheric Sciences Program at the University of Nevada, Reno.

Oral presentation, Wednesday, 11:00 AM, C121

Three New Fire Weather/Climate Datasets for Decision-Support and Research

In support of the Fire Program Analysis (FPA) project, three new fire weather/climate datasets have been generated for use in fire management planning activities and scientific research. These include 8- and 32-km daily gridded datasets of fire weather elements, and a temporally complete dataset of hourly Remote Automated Weather Station (RAWS) for approximately 1700 stations. The datasets cover the period 1980 through the present. Weather elements include temperature, humidity, wind, precipitation and solar radiation (for RAWS). Statistical and downscaling methods were used to create the datasets employing the North American Regional Reanalysis (NARR) and Parameter-elevation Regressions on Independent Slopes Model (PRISM) along with original QC'd observed values. The datasets are formatted for input into decision-support tools such as FireFamily+. Climatological information has been derived from the datasets including summaries of the basic meteorological elements and fire danger. This presentation will describe the datasets, provide some detail of their development, show some climatological results, and highlight their value and benefit to fire management and research.

Bryan, Earl

Forest Wildlife Management Major, Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University

Oral presentation, Thursday, 1:40 PM, C126

Wildland Fuels Assessment in the Veluwe Region of The Netherlands

The Netherlands is facing an increasing number, size and intensity of wildland fires. However, local and regional safety agencies and fire professionals do not have any quantified information on wildland fuels to base management decisions. In the summer of 2012, a 4 student crew made up of students from the US and The Netherlands, assessed wildland fuels on a variety of sites representing 4 common vegetative communities (Scots pine, Heather, Beach, Douglas-fir) found in the most heavily utilized nature area on the country. A photo guide is being developed to assist managements, fire fighters and agency professionals address this growing issue.

Buma, Brian

Brian Buma, PhD Candidate, University of Colorado, Boulder. Brian has published on the nature of compound disturbances and contributed to our understanding of resilience dynamics in multiple disturbance situations.

Oral presentation, Wednesday, 1:40 PM, B114

Fire catalyzed regime shifts, carbon sequestration, and climate change: A case for active management?

Large fires and other severe disturbances may exceed an ecosystems resilience, pushing them into alternate regimes. Forests may shift to grasslands, for example. This has important implications for management. Will ecosystem services shift as the regime shifts? And how will climate change impact those ecosystem services? A study from the subalpine forests of Colorado is presented, with evidence that a coniferous to deciduous regime shift had minimal effects on carbon stocks, but climate change overshadowed fire resilience in the long term. Management scenarios which either let natural dynamics run their course (no action) or supplemented natural resilience (planting local species) were ineffective in maintaining this ecosystem service; adaptive strategies including planting non-local species were more successful. In cases where preservation of ecosystem services is a priority, management must consider future climate conditions when planning responses. We further present scenarios for how this adaptation may play out in practice. The long maturation time of forests requires adaptive strategies to be implemented now, rather than waiting for conditions to change, although this must happen in an ecologically and socially responsible fashion. Disturbances, and especially wide-spread disturbances common in large fire years, should be seen as opportunities for climatic adaptation.

Burrows, Neil

Dr Neil Burrows is a Senior Principal Research Scientist and former Science Director with the Western Australian Department of Environment and Conservation. He has 35 years experience working as an applied fire scientist, investigating fire behaviour and fire ecology in a range of ecosystems to improve fire management for community protection and conservation outcomes. With more than 90 scientific publications, he has made a significant contribution to fire knowledge, policy and management in Western Australia.

Banquet Featured Speaker, Thursday, 6:30 PM, Ballroom

More burning, less fire

I explore trends in the relationship between people, prescribed fire and wildfire in two fire-prone but contrasting Australian bioregions – the vast Western Desert and the south-west eucalypt forests. Aborigines have been burning the spinifex grasslands of the Western Desert for thousands of years, a practice that continued until the 1960s when first contact was made with Europeans. With the departure of people and their burning from large tracts of the desert, the fine-grained mosaic of seral stages quickly gave way to a regime of very large lightning-caused wildfires, coincident with the decline and extinction of a range of medium size mammals. In this sparsely populated region the broader community 'care factor' in relation to bushfires is low. This contrasts with the south-west Australian forest region, which is well populated and developed, so the bushfire 'care factor' is high. Land managers have been prescribed burning the forests for almost 60 years, making it one of the oldest programs in the modern world. Underpinned by science, prescribed burning is the cornerstone of bushfire mitigation and community protection, but it is controversial. While the program has been successful, fire scientists and managers continue to grapple with two fundamental issues. Firstly, knowing the most appropriate fire regime to implement to achieve community protection and conservation goals, and secondly, being able to continue to effectively implement the program at meaningful spatial and temporal scales. While knowledge is imperfect, there is a substantial body of fire ecology science but this is usually complex, not readily accessible and sometimes contradictory, so needs to be synthesised and presented as practical fire management paradigms and policies. In a fast changing world, there are also operational challenges to implementing prescribed burning programs, including political and community support, climate change, population growth, land use changes, air quality issues and management capacity.

Burrows, Neil

(See biographical information, above.)

Oral presentation, Thursday, 11:00 AM, B111

Mosaic burning for biodiversity conservation in south-west Australian forest ecosystems

The Fire Mosaic Project is an example of science-based adaptive management to improve fire management and biodiversity outcomes in native forests of south-west Australia. It is a landscape-scale trial (~10,000 ha) involving scientists and fire practitioners to determine whether a fine-grained fire-induced mosaic can be created by the frequent and targeted introduction of fire into the landscape (patch-burning) to a) provide seral and habitat diversity thereby benefitting biodiversity and b) increase the resilience of these landscapes to wildfire. Since the inception of the project in 2003, a fine-scale mosaic of vegetation at different seral stages, mapped by remote sensing, is emerging as a consequence of regular but targeted helicopter ignitions under carefully prescribed conditions. Monitoring of the biota, including plants, macrofungi, invertebrates, cryptogams, birds, reptiles and small mammals on a network of permanent grids in the mosaic area and on nearby reference areas is demonstrating greater biodiversity (species richness and habitat diversity) in the emerging mosaic compared with the reference areas that have a more uniform fire treatment. Lower order organisms such as invertebrates and macrofungi are most responsive. Operational difficulties experienced in implementing and maintaining a fine scale mosaic and preliminary data and observations on how the biota are responding to the emerging mosaic will be presented.

Busch, Colleen

COLLEEN MORTON BUSCH is the author of FIRE MONKS, named a best book of 2011 by Publisher's Weekly and the San Francisco Chronicle. Busch has worked as a college instructor in New Orleans and Beijing, a magazine editor, and a freelance writer. Her work has appeared in Yoga Journal, where she was a senior editor, Tricycle, Shambhala Sun, the San Francisco Chronicle, and numerous literary magazines. She blogs for the Huffington Post and is currently at work on a novel. A Zen student and outdoor enthusiast, Busch lives in Northern California.   REV. KANSAN DAVID ZIMMERMAN has been practicing Zen for more than 20 years. In 2006 he was ordained in the lineage of Shunryu Suzuki Roshi and spent eight years at Tassajara Zen Mountain Center, the oldest Zen Buddhist monastery in the West. David was Tassajara Director at the time of the 2008 Basin Complex fire that threatened the community, and was one of five monks who stayed behind to meet the fire when it arrived. He currently lives at San Francisco Zen Center, where he is Program Director, in addition to teaching and leading workshops on living an awakened, compassionate life.

Plenary talk, Tuesday, 9:50 AM, Ballroom

The fire-adapted landscape & the fire-adapted mind: Living and practicing with fire

In 2008, a wildfire threatened Tassajara, the oldest Zen Buddhist monastery in the United States. When mandatory evacuation orders came and firefighters left the creek-fed valley where Tassajara is situated, several monks decided to stay put alone and successfully defended their home. Their story, told in the book FIRE MONKS: ZEN MIND MEETS WILDFIRE, presents a vivid example of a community's efforts to live responsibly in fire country—the Ventana Wilderness east of Big Sur—and in harmony with wildfire. The decision to stay when the fire arrived was made carefully, considering various factors, including Tassajara's location in a riparian corridor and defensibility in previous fires, the residents' recognition of fire's native ecological role, as well as their extensive preparations and shared trust in their ability to maintain safe situational awareness. The author of FIRE MONKS and one of the Tassajara residents who stayed during the fire will discuss what happened in 2008, exploring how the human heart and mind constitute another branch of ecology and how both the human and natural environment can be supported and managed through mindfulness.

Butz, Ramona

Dr. Ramona Butz is currently the Province Ecologist for the Klamath, Mendocino, Shasta-Trinity, and Six Rivers National Forests in northwestern California. She also holds an adjunct faculty position in the Department of Forestry and Wildland Resources at Humboldt State University in Arcata, California. Dr. Butz has been working on issues in fire ecology and traditional fire management practices in East Africa for the past 14 years.

Oral presentation, Tuesday, 1:40 PM, B118

Traditional fire management: historical fire regimes and land use change in pastoral East Africa

Although there is considerable research on the ecological effects of fire in sub-Saharan Africa, research on traditional fire practices is very limited and the consequences of substantial changes to historical fire regimes have not been adequately

explored. This study examines historic and contemporary uses of fire as a land management tool among a group of semi-nomadic Maasai pastoralists in northern Tanzania and explores the potential impacts of changing fire management and fire suppression on savanna vegetation. Village members were interviewed about historical and current practices, reasons for burning, the history of land use, and their perceptions of fire. Eight recent burn sites were selected for examination of size, ignition source, and timing of the burn. The Maasai identified eight major reasons for using fire on a landscape scale in savannas and historically used a progression of small fires throughout the dry season as grasses cured to create a fragmented burn pattern and to prevent large, catastrophic late-season fires. Currently there is little active vegetation management using fire largely due to federal fire suppression policies, unpredictable rainfall patterns, increasing population pressures, and a subsequent increase in the number of catastrophic accidental fires. Substantial modifications to historical fire regimes could have cascading consequences for savanna health by increasing late-season fuel loads and the occurrence of large, catastrophic fires.

Bybee, Jordan

My name is Jordan Bybee and I am a graduate student at Brigham Young University.

Oral presentation, Thursday, 1:40 PM, B112

Mechanical shredding as a fire surrogate in restoring sagebrush grasslands

Piñon and juniper (PJ) have been encroaching on sagebrush grasslands since the mid1800's, decreasing desired plant understory cover and diversity. In order to restore this system land managers have implemented a variety of treatments to remove trees. The objective of this study was to determine the usefulness of mechanical shredding as a management tool to restore shrub, grass, and forb cover. We selected 45 study sites across the state of Utah on both BLM and USFS land based on comparable untreated areas, initial tree cover, location, and time since mastication. Sample plots were located using pre-treatment NAIP imagery and feature extraction (ENVI 4.5) to randomly select and pair untreated and treated subplots that had the same initial tree cover. Data was collected in spring and summer of 2011 and 2012. Data collection methods included line point intercept, herbaceous density quadrats, shrub density, and herbaceous biomass measurements. Preliminary observations suggest higher perennial grass cover following shredding than that found in untreated areas. While we did see some weed invasion, it was minimal where perennial grasses and shrubs were dominant. By better understanding plant response (both desirable understory species and weeds) following tree shredding, we will provide land managers information that will better support the management of sagebrush grasslands.

Calkin, David

Dave Calkin is a research forester with the USDA Forest Service Rocky Mountain Research Station's Human DimensionsProgram. Dave is the lead for the wildfire economics team of the National Fire Decision Support Center and is stationed in Missoula, MT. Dave and his team conduct research on wildfire risk assessment at a variety of scales from project level planning to national level allocation, evaluate the costs and returns from various wildfire mitigation programs, develop decision support tools, and explore the impact of fire management policy, managerial incentives and risk preferences on wildfire decision making. Dave holds a PhD in economics from Oregon State University's College of Forestry, a MS in resource conservation from the University of Montana, and a BS in applied mathematics from the University of Virginia.

Oral presentation, Tuesday, 1:40 PM, C121

Risk-Risk Tradeoffs: Suppression Effectiveness versus Firefighter Exposure

When a wildfire occurs managers are charged with evaluating and selecting strategies that employ suppression resources to alter potential fire outcomes. Inherent in the selection of an individual strategy is a tradeoff betweem the cost of implementing the strategy (both financial and physical risk to firefighters) and the benefits of a strategy (reduced net fire damage). At the time of the decision there can be considerable uncertainty regarding both the cost and benefits of a given strategy as well as the likelihood that a selected strategy will meet its intended objectives. In this presentation we identify current levels of suppression resource utilization at the individual fire level and discuss the linkage between resource utilization, productive efficiency, and firefighter exposure. We present recent research that attempts to illuminate how managers currently consider these tradeoffs and select strategies. We discuss issues associated with the existing management incentive structure, potential issues of risk transference, and common decision making biases. We conclude with a discussion of how basic risk management principles can help managers more explicitly consider the tradeoffs accounting for the uncertainty of the fire management environment.

Cansler, C. Alina

C. Alina Cansler is a Research Assistant with the Fire and Mountain Ecology Lab at the School of Environmental and Forest Sciences, University of Washington. Her research interests include landscape ecology and fire ecology. Her M.S. research focused on the causes and ecological consequences of spatial variation of burn severity in the Washington Cascade Range. Her current Ph.D. research examines how fire severity and post-fire tree regeneration influence landscape pattern in the alpine-treeline ecotone of the northern Cascade Range and northern Rocky Mountains. She previously worked for the National Park Service monitoring the effects of prescribed fire on vegetation and fuels in the Colorado Plateau and Pacific Northwest.

Oral presentation, Tuesday, 3:50 PM, C125

Investigating the causes of spatial and temporal variation in burn severity at local and regional scales in the Washington Cascade Range

We summarize completed and ongoing research validating remotely sensed indices of burn severity, and the use of these indices to investigate the influence of climate, weather, topography, and fuels on fire severity. We evaluated the explanatory power and classification accuracy of two indices of burn severity—the Relative differenced Normalized Burn Ratio (RdNBR) and the differenced Normalized Burn Ratio (dNBR)—using a large data set of field plots (n = 639) from four fires. We found little difference between models predicting dNBR vs. RdNBR, but found higher classification accuracy in the high-severity and unchanged classes for both indices. Cross-regional comparisons show that RdNBR produces high-severity classification thresholds more consistently than dNBR. The regional validation of the two indices provided a foundation for multi-scale analyses of the drivers of fire severity. A regional analysis using RdNBR-based fire-severity data from 125 fires that occurred from 1984-2008 in the northern Cascade Range showed that the severity and size of high-severity patches increased with fire size and warmer and dryer climate. Nevertheless, the within-fire severity mosaic reflected the underlying variability of topography. The relationship between fire severity, fuel treatments, and other drivers of fire severity was also evaluated using sequential autoregressive modeling within the 70,000 ha Tripod Complex of 2006. Significant predictor variables of dNBR included fuel treatment type, landform, fire weather, and vegetation characteristics. Fuel treatments that included prescribed burning produced lower fire severity than untreated areas and thinning-only treatments. Both the regional and fire-level analyses indicate that even during extreme weather or climate, topography and fuels influence the spatial pattern of fire severity.

Carter, Vachel

Vachel Carter Doctoral Student Department of Geography, University of Utah   I am a 2nd year PhD student. My research interests are forest disturbances in the Intermountain west and paleoecology. The disturbances that I am particularly interested in are mountain pine beetle, fire and dwarf mistletoe.

Oral presentation, Tuesday, 3:25 PM, B113

Assessment of fire severity and vegetation response using high-resolution pollen from a sedimentary record in southeastern Wyoming, USA

Paleoecologists use fossil pollen for reconstructing vegetation histories, and macroscopic charcoal for reconstructing fire histories. The combined vegetation and fire histories are then used to infer climate variability over long time scales. Currently, macroscopic charcoal is used to reconstruct fire frequency at the watershed scale, but is unable to describe fire regimes because of the inability of fossil charcoal to characterize fire severities. The work presented here uses high-resolution pollen and charcoal to determine fire severity. This study analyzes the vegetation response after fire events between 2,000 to 4,000 calendar years before present (cal yr BP) in southeastern Wyoming, USA. Pollen data suggest from 3,100 to 4,000 cal yr BP drier conditions persisted and resulted in an upslope ecotone shift from lodgepole pine to quaking aspen. Preliminary charcoal data suggest fire frequency decreased and that biomass burning shifted as a result of the aspen dominated system. Pollen data suggest from 2,000 to 3,100 cal yr BP, the vegetation shifted back to a lodgepole pine dominated system as a result of wetter-than-before conditions. Charcoal data suggest fire frequency increased as a result of the wetter-than-before conditions. These results suggest the importance of understanding vegetation-fire linkages for characterizing low, mid and high severity fire regimes in lodgepole pine systems. This information will provide a better understanding of fire regime variability in shifting ecosystems that land managers can use to determine future management practices in lodgepole pine systems.

Chambers, Jeanne

Jeanne Chambers has a Master's degree in Rangeland Science and a PhD in Biology/Ecology from Utah State University. She is a research ecologist with the US Forest Service, Rocky Mountain Research Station with expertise in plant, disturbance, and restoration ecology. Her current research focus is on the abiotic and biotic factors that make ecosystems (1) resilient to stressors like climate change and to disturbances like fire, and (2) resistant to invasion by exotic species. Most of her work is conducted in the arid and semi-arid ecosytems of the Intermountain Region of the western US.

Oral presentation, Wednesday, 2:30 PM, B115

Resistance to invasive annual grasses in fire prone sagebrush and pinyon-juniper ecosystems: management implications

Resistance to invasive annual grasses in fire prone sagebrush and pinyon-juniper ecosystems: management implications Invasive annual grasses, especially cheatgrass (Bromus tectorum), have altered fire regimes across millions of hectares in the Intermountain Region of the Western US, and are placing sagebrush and pinyon-juniper ecosystems and the services they provide at risk. Understanding resistance to invasion – the abiotic and biotic factors that limit population growth of the invader – is essential for prioritizing management activities. Our research indicates that resistance to cheatgrass is primarily a function of (1) the environmental conditions that determine its distribution such as temperature and effective precipitation (fundamental niche), and (2) the ecological conditions that influence resource availability and its competitive interactions (realized niche). Factors that increase woody species abundance at the expense of perennial grasses and forbs, like overgrazing by livestock, increases in CO_2, and ongoing climate change, typically decrease ecosystem resistance to cheatgrass. Increased resource availability in the upper soil profile can facilitate cheatgrass establishment in the pre-fire environment and population growth and expansion in the post-fire environment. Fire and fire surrogate treatments that reduce woody vegetation are used to both reduce fuel loads and increase resistance to cheatgrass through competitive release of perennial grasses and forbs. However, the ecological conditions (e.g., pre-treatment plant composition and structure) and the type of treatment (fire vs. mechanical) can affect relative resistance. Knowledge of the environmental and ecological conditions that influence resistance to cheatgrass can be used to prioritize management areas and determine the most effective treatment method.

Charnley, Susan

Susan Charnley is a Research Social Scientist in the Goods, Services, and Values Program of the US Forest Service's Pacific Northwest Research Station in Portland, OR. Her research focuses on communities and natural resource management.

Oral presentation, Wednesday, 4:15 PM, B113

Variation in Forest Management for Fire Across Ownerships: Implications for Forest Restoration

Wildland fire is a leading forest management challenge in the western U.S., and the importance of managing fire at the landscape scale to promote ecological resilience of forest ecosystems to fire is widely recognized. Yet doing so in mixed-ownership landscapes is challenging. We hypothesize that different social drivers of coupled human-natural systems operate in different parts of the forested landscape, leading to differences in fire hazard conditions, and that these differences vary by forest ownership. To test this hypothesis, we examine forest management by four groups of landowners and managers in south-central Oregon whose lands intermingle – the Fremont-Winema National Forest, the Oregon Department of Forestry, the Klamath Tribes, and private, corporate owners – and its environmental outcomes. First we analyze how fire hazard conditions vary by ownership. Next we compare the land management objectives of the four different owner/manager groups and how they influence forest management with regard to fire. Then we examine the social-political-economic context in which forest management by each group occurs, and how it influences their practices on the ground. We find that forest conditions with regard to fire vary both within and between owner/manager groups, and are a product of (1) their different management objectives combined with (2) different sets of social-political-economic variables that influence them and shape their forest management practices. Thus, improving forest resilience to fire at the landscape scale across ownerships is not a matter of getting different actors to adopt the same management objectives and practices; or, of addressing a set of key, common constraints. Rather, it is a matter of understanding and addressing different drivers of coupled human-natural system interactions in different parts of the landscape. We explore the policy implications of our findings for promoting an "all lands approach" to forest restoration that reduces the risk of uncharacteristically severe wildland fire.

Cissel, John

John Cissel Program Manager - Joint Fire Science Program (2006-present) Research Coordinator - Oregon BLM (2002-2006) HJ Andrews Experimental Forest Director - Oregon State University (2002) Rsearch Liaison HJ Andrews Experi-

mental Forest, Central Cascades Adaptive Management Area, Cascade Center for Ecosystem Management - Willamette National Forest (1990-2002) Sysyems Analyst, Forest Planning Group Leader - Ochoco and Willamette National Forests (1981-2000) 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.

Oral presentation, Thursday, 1:40 PM, B110

Tools and Technology: From the developer to the user community in the 21st century

Recommendation 3 submitted to the Joint Fire Science Program Governing Board over a decade ago stated that "The process of tool use including comparison, selection, acquisition, training, implementation, evaluation, and support needs national administrative focus, guidance, and support." A decade ago computer technology had advanced to a point that allowed for development of complex prediction models for fire behavior and fire effects. This new technology was mainly available to researchers and scientists with limited use within the fire management community.   Over the last 13 years, existing and new computational models have been incorporated into dozens of unique standalone software systems, each with their own interface. In the short run, this has been of great benefit to the management community allowing applications in a wide variety of fuels treatment, wildfire response and post-fire planning contexts. In the long run, this profusion of computational models and software systems, mostly designed for desktop installations, has contributed to significant confusion, dysfunction, and inefficiency among model users, system administrators, and model developers alike. Frustration with the status quo has surfaced in many contexts, including surveys showing that the fire community is overwhelmed with the number of tools available.   Assessments funded by the Joint Fire Science Program show that existing web-based model and data integration frameworks offer great promise to support solutions to these problems (e.g., IFTDSS, WFDSS, and BlueSky). In the future, a relatively small number of broad-scope, web-based integration frameworks specific to the business needs of particular domains that each have access to a virtual library of common services (e.g., computational models) could efficiently address most of the fire and fuels communities needs. However, technology is only part of the answer. Leaders of both management and science communities need to adapt behaviors to fully capitalize on these investments.

Cissel, John

(See biographical information, above.)

Oral presentation, Tuesday, 11:00 AM, B111

The JFSP Knowledge Exchange Consortia: Science Exchange and Adoption through Regional Partnerships

The JFSP Knowledge Exchange Consortia are a national network of regional partnerships established by the Governing Board of the Joint Fire Science Program (JFSP) as a response to recommendations from the 2008 JFSP program review. The consortia were created through open proposal solicitations and reviews to enhance fire science knowledge exchange and adoption at field levels. The intent was to significantly increase science exchange effectiveness by adding resources and organization to existing science delivery partnerships and programs, and to create an interactive national network of regional consortia that could learn from each other. Today, there are 14 regional consortia serving most of the US.   The consortia serve as fire science-management boundary organizations at regional levels, straddling two cultures each with their own ways of doing business and incentives. The phrase "knowledge exchange" in the network title emphasizes the bidirectional nature of learning that is the intent of the network. The consortia are staffing the science-management interface to build and reinforce connections across the boundary.   The consortia are engaged in a wide range of passive and active activities based on regional needs assessments. Many activities are in common (e.g., websites, webinars, social media, workshops, fact sheets), and many are unique. For example, the Great Basin consortium organized scientist-manager cadres to provide direct assistance to managers on the ground; the Alaska consortium used fine arts to foster alternative perspectives on the roles of scientists, managers and the public regarding fire; and the Great Lakes consortium is conducting a comprehensive meta-analysis of existing research to get a clear sense of the state of the science in a less-studied region.   The consortia are using social science to understand and improve science communication processes, and JFSP engaged investigators with extensive program evaluation experience to conduct an ongoing evaluation of consortia effectiveness.

Clark, Jason

Jason A Clark Masters Candidate Yale School of Forestry and Environmental Studies Fulbright Scholar 2008-9 (China, Reforestation); Wyss Conservation Scholar 2011-12.

Oral presentation, Tuesday, 3:50 PM, B110

A landscape in transition: Modeling effects of climate changes and wildfire on vegetation pattern and process in Yellowstone National Park.

Climate projections for the next 100 years forecast higher temperatures and variable levels of precipitation in the western United States, with associated changes in carbon budgets, wildfire intensity and severity, and species composition and distributions. Design of effective management strategies under changing conditions is difficult because models project a range of potential future climate regimes and associated impacts, and the effects of climate changes on ecosystems are often very complex and operate across taxa and scales. Thus, managers are challenged to craft mitigation strategies that fully account for these complexities. We used the mechanistic simulation model FireBGCv2 to explore potential effects of three climate regimes (current climate, warm-wet, and hot-dry scenarios) coupled with existing management treatments in Yellowstone National Park. We tested the effects of climate and fire suppression on forest composition, biomass, and fire regime. Our analysis separates the effects of climate and fire as disturbance factors and outlines possible forest and fire regime trajectories for Yellowstone National Park. Most simulated climate changes resulted in changes to vegetation and fire regimes. Simulation outcomes were highly sensitive to each climate model and fire suppression scenario. Our results provide information that may be useful for the development of long-term management plans to reduce vulnerability and maximize climate change adaptation over a range of future conditions. The study offers a new perspective on future forest and fire conditions in Yellowstone National Park.

Cochrane, Mark

Dr. Mark A. Cochrane is a Professor at the Geographic Information Science Center of Excellence (GIScCE) at South Dakota State University. He holds a doctorate in Ecology from Pennsylvania State University and a baccalaureate in Environmental Engineering from the Massachusetts Institute of Technology. His research focuses on understanding spatial patterns, interactions and synergisms between the multiple physical and biological factors that affect ecosystems. Dr. Cochrane investigates the drivers and effects of disturbance regime changes resulting from various forms of forest degradation, including fire, fuels management, fragmentation and logging. His interdisciplinary work combines remote sensing, ecology and other fields of study to provide a landscape perspective of the dynamic processes involved in land-cover change.

Oral presentation, Thursday, 11:00 AM, B118

Forest management implications of recent fuel treatment effectiveness assessments for mitigating landscape-level risks from wildfires

Human land use practices, altered climates, and shifting forest and fire management policies have increased the frequency of large wildfires several-fold. Mitigation of potential fire behavior and fire severity through pre-fire alteration of wildland fuels using mechanical treatments and prescribed fires is now a common land management tactic. Despite annual treatment of more than million hectares of land, comparative quantitative assessments of the effectiveness of existing fuel treatments at reducing the size or severity of actual wildfires have been lacking. We report here the statistical results of thousands of fuels treatments on fire severity for 650 fires that occurred between 2001-2010 across the United States. We show analyses as functions of treatment type, age, and forest ecosystem/region. We also utilized the Landsat-based Monitoring Trends in Burn Severity (MTBS) fire perimeters in combination with LANDFIRE datasets and ancillary information on weather during wildfires and fuels treatments to create multiple FARSITE simulations of 87 historical wildfires to estimate changes in wildfire extent and spatial probabilities of burning as a function of the extant fuels treatments. Fuels treatments effectively redistribute fire risk on the landscape by changing surface fire spread rates and reducing the likelihood of crowning behavior. In general, trade offs are created between formation of large areas with low probability of increased burning and smaller, well-defined regions with reduced fire risk. However, from a management perspective, the regional variations of different types and ages of treatment performance are more important than the average effects across the nation. Our research provides guidance on which treatment types and frequencies of re-application are most effective for different ecoregions.

Cochrane, Mark

Dr. Mark A. 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. In his ongoing research program, Dr. Cochrane continues to investigate the drivers and effects of disturbance regime changes resulting from various forms of forest degradation, including fire, fragmentation and logging as well as the mitigating effects of forest management. He holds a Ph.D. in Ecology from Pennsylvania State University and a S.B. in Environmental Engineering from the Massachusetts Institute of Technology.

Oral presentation, Wednesday, 2:05 PM, C125

Combining remote sensing and spatial modeling to assess site and landscape level effects of fuels treatments on wildland fire

Understanding the influences of forest management practices on wildfire severity and spread are critical in fire-prone ecosystems of the United States. Human land use practices, altered climates, and shifting forest and fire management policies have increased the frequency of large wildfires several-fold. Mitigation of potential fire behavior and fire severity have increasingly been attempted through pre-fire alteration of wildland fuels using mechanical treatments and prescribed fires. Despite annual treatment of more than million hectares of land, comparative quantitative assessments of the effectiveness of existing fuel treatments at reducing the size or severity of actual wildfires or how they might alter the risk of burning across landscapes are currently lacking. Newly available geospatial datasets characterizing vegetation, fuels, topography, and burn severity offer new opportunities for studying fuel treatment effectiveness at regional to national scales. We utilized the Landsat-based Monitoring Trends in Burn Severity (MTBS) fire perimeters in combination with LANDFIRE datasets and ancillary information on weather during wildfires and fuels treatments to create multiple FARSITE simulations of 87 historical wildfires to estimate spatial probabilities of burning as a function of the extant fuels treatments across the wildland fire-affected landscape. Fuels treatments effectively redistribute fire risk on the landscape by changing surface fire spread rates and reducing the likelihood of crowning behavior. Trade offs are created between formation of large areas with low probability of increased burning and smaller, well-defined regions with reduced fire risk. For over 500 historical fires we also provide statistical analyses of the changes in fire severity, as measured by MTBS with using dNBR metrics, which are attributable to fuels treatments. This research demonstrates the feasibility of carrying out landscape-level assessments of fuel treatment effectiveness using geospatial datasets and spatial modeling and highlights the potential for using remotely sensed data and derived products in land and fire management.

Cohn, Greg

Greg Cohn is a Forestry Technician at the Forest Service Fire Lab in Missoula. He started working for the Forest Service Fire Lab in 2006 while finishing his undergraduate degree at the University of Montana. There he earned a B.S. in Resource Conservation, a minor in Wildland Restoration, and a certificate in GIS from the School of Forestry. Hooked on skiing and hiking, he has stayed in Missoula as a fuels and post fire assessment specialist at the Missoula Fire Lab. He has contributed to work on post fire severity, fuel mapping, insect disturbance, fire behavior modeling, and recently published a paper on relationships between moisture, chemistry and ignition of needles during mountain pine beetle attack.

Oral presentation, Tuesday, 11:25 AM, C122

Western spruce budworm defoliation induced canopy fuel reductions increase thresholds for torching and crowning: A cross-scale sensitivity analysis using a physics-based fire model

Native defoliating insects have been reducing the needle load of tree canopies in mixed conifer forests across western North America for centuries, but the effects of this defoliation on fire behavior are poorly understood. Attacks by western spruce budworm (Choristoneura occidentalis Freeman), one of the most damaging defoliators, reduce canopy bulk density which might in turn affect the threshold for surface fires to torch (ignite the crowns of individual trees) or crown (spread between tree crowns). To assess the effect of defoliation on torching and crowning potential, we conducted a sensitivity analysis with the Wildland-Urban Interface Fire Dynamic Simulator, within and among trees as part of a larger project investigating interactions between forest fires and defoliating insects like western spruce budworm across multiple scales of time and space. We modeled defoliation, potential branchwood drying and two aspects of how the phenomenon is represented in the fire model (spatial distribution of defoliation within tree crowns and model resolution). In our simulations, defoliation reduced both torching and crowning potential. The surface fire intensity required for ignition decreased with fuel heterogeneity, moisture, and resolution, but differences were much smaller than increases in surface fire ignition requirements caused by defoliation.

Collins, Brandon

Brandon Collins is a Research Forester with the US Forest Service, Pacific Southwest Research Station. His research interests involve characterizing effects of fire and fuels treatments on forests with the intent of providing meaningful informa-

tion to managers interested in improving forest 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.

Oral presentation, Thursday, 3:25 PM, B114

Severe fire weather and fire activity in the northern Sierra Nevada

Fuels, weather, and topography all contribute to observed fire behavior. Of these, weather is not only the most dynamic factor it is the most influential on fire spread and intensity. Given the current efficiency in fire suppression much of the area burned annually comes from large fires occurring under high to extreme fire weather. Among the effects that climate change could have on fire activity (e.g., longer summer drought, changes in species composition, type conversion though vegetation–fire feedbacks) changes in the frequency of severe fire weather is likely to have disproportionately large influence. In this study we analyze 50 years of daily fire weather observations to investigate potential changes or trends in the frequency of severe fire weather. We do this for the northern Sierra Nevada, which has experienced numerous large and severe fires over the last several years. In addition we explore the potential for lower frequency teleconnections (ENSO, PDO, PNA) possibly driving changes in severe fire weather occurrence. These results may provide insight into what appears to be a relatively abrupt increase in fire activity in the northern Sierra Nevada.

Collins, Byron

Byron Collins began woking with the Rocky Mountain Research Station in 2007 as a Master's student studying the effects of forest management on mountain pine beetle in lodgepole pine forests of Colorado. Since finishing his degree in 2010, Byron has continued his work at RMRS publishing 3 journal articles with his colleagues related to mountain pine beetle, salvage logging and future fire behavior. Byron is currently assisting RMRS researchers with a project focused on ecosystem recovery following Colorado's 2002 Hayman Fire.

Oral presentation, Thursday, 3:25 PM, C121

The effects of bark beetle oubreaks and salvage logging on forest development, fuel loads and potential fire behavior in Colorado lodgepole pine forests

Recent mountain pine beetle infestations have resulted in widespread tree mortality and the accumulation of dead woody fuels across the Rocky Mountain region, creating concerns over future forest stand conditions and fire behavior. We quantified how salvage logging influenced tree regeneration and fuel loads relative to nearby, uncut stands for twenty-four lodgepole pine forests in north-central Colorado that had experienced > 70% overstory mortality from mountain pine beetles. We used our field measurements to predict changes in fuel loads and potential fire behavior in the forests that develop over the century following the outbreak and associated harvesting. Our field measurements and stand development projections suggest that salvage logging will alter the potential for canopy fire behavior in future stands by creating conditions that promote regeneration of lodgepole pine and quaking aspen as opposed to subalpine fir. The abundant subalpine fir that has regenerated in untreated, beetle-killed stands is predicted to form a stratum of ladder fuels more likely to allow fires burning on the surface to spread into the forest canopy. Harvesting increased woody surface fuels more than 3-fold compared to untreated stands immediately after treatments; however, coarse fuels will increase substantially (by ~55 Mg ha-1) in untreated stands within three decades of the beetle infestation as dead trees topple, and the elevated fuel loads will persist for more than a century. Though salvage logging will treat a small fraction of beetle-infested Colorado forests, in those areas treatment will affect stand development and fuel loads and will alter potential fire behavior for more than a century.

Comer, Chris

Associate Professor of Wildlife Management, Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University. Dr. Comer obtained his BS from Carleton college, his MS from Penn State University, and his Ph.d. from the University of Georgia. Chris has been recognized by SFA for his teaching with a Teaching Excellence Award, and by the Texas Wildlife Society.

Oral presentation, Thursday, 11:00 AM, C126

Deeprooted sedge (Cyperus entrerianus) seed bank response to prescribed fire and moist soil treatments

The influence of seed banks on the immediate or eventual success of exotic invasive plant management is often overlooked or underemphasized, but nearly universally poorly understood. We examined deeprooted sedge (Cyperus entrerianus)

seedling emergence from seed bank samples (1) collected prior to and after a prescribed fire and (2) exposed to permanently flooded or moist-soil treatments, from samples at the Anahuac National Wildlife Refuge on the upper Texas coast. There were > 10 times more deep-rooted sedge seedlings in moist (i.e pre- and post-burn moist) than flooded (i.e., pre- and post-burn flooded) treatments. Throughout, samples exposed to flooding treatments had few deep-rooted sedge seedlings, regardless of collection time or plot (stem) density. Numbers of deep-rooted sedge seedlings were between pre-burn and post-burn samples, where watering regime exerted a greater effect on deep-rooted sedge seedling emergence than prescribed fire. Prescribed fire (during winter) does not effectively reduce deep-rooted sedge seed banks, and in fact tends to improve conditions for aboveground recovery and seed germination. Lethal fire-induced temperatures do not penetrate very deep below the ground surface and do not exceed lethal temperatures long enough or deep enough to have any substantial impact on reducing deep-rooted sedge seed bank potential. Prescribed fires during the non-growing season do not kill enough seeds to impart any measurable difference in numbers of seedlings and generally moist winter conditions in Texas coastal prairie may actual enhance and promote further deep-rooted sedge expansion.

Comish, Ken

Ken Comish, Graduate Student at Virginia Tech, studying forestry. Wildland Firefighter for Virginia's Department of Forestry.

Oral presentation, Tuesday, 1:15 PM, C126

Long-term Effects of Silvicultural Treatments for the Control of R. maximum in the Southern Appalachians

Rosebay rhododendron (R. maximum L.) is expanding its range and influence in the forests of the southern Appalachians as a consequence of anthropogenic behaviours, creating nearly impermeable thickets that diminish species biodiversity and alter forest composition at the expense of the tree canopy. This study will facilitate the reduction of rhododendron in managed forest lands by assessing the effects over time of various combinations of silvicultural treatments and quantifying them into effective treatment regimes. By monitoring rhododendron mortality and canopy seedling regeneration, it was determined that combinations of treatments are more effective than if used separately, and that greater light availability on the forest floor governs seedling abundance. The combined used of mechanical cutting followed by prescribed burning, or using prescribed fire with herbicide applications of imazapyr were found to most effectively reduce rhododendron to the benefit of tree seedlings. If prescribed fire managers generate a 'hot and steady' head fire, treatments could last as much as ten years before re-treatment is required.

Connot, Joel

Joel Connot is a Senior Scientist with Stinger Ghaffarian Technologies (SGT, Inc.) contracting with the DOI USGS Earth Resources Observation and Science (EROS) Center. Connot's role in LANDFIRE has been to map existing vegetation structure for CONUS in support of LF 2008 (Refresh) and to support the mapping of disturbances for LF 2008 (Refresh) and LF 2010 (1.2.0). Also, he supports information transfer providing technical editing for process documentation and as a content filter for the projects web site. He received his B.A. degree in Geography from University of Nebraska, Lincoln in 1995 and his M.A. degree in Geography from the University of Nebraska, Lincoln in 2005.

Oral presentation, Wednesday, 3:25 PM, B110

Disturbance Mapping

Updating the LANDFIRE data layers is an ambitious undertaking. Updates to LANDFIRE datasets reflect the best available data depicting the landscape. LANDFIRE relies upon field contributed spatial information reflecting landscape change and fire severity mapping products from national programs, such as Monitoring Trends in Burn Severity (MTBS), Burned Area Reflectance Classification (BARC) and Rapid Assessment of Vegetation Condition after Wildfire (RAVG). Although, these contributions are necessary to create the best product possible, LANDFIRE also relies upon a process known as Remote Sensing of Landscape Change (RSLC) to supplement contributed data and other map products. For the LANDFIRE 2008 RSLC, the Vegetation Change Tracker (VCT) algorithm was used to identify pixels likely to have experienced disturbance. Using VCT, Landsat Time Series Stacks (LTSS) consisting of one scene per year from 1984 to 2009 were processed to create change products (approximately 11,000 scenes for CONUS). To create LANDFIRE 2010 RSLC, Multi-Index Integrated Change Analysis (MIICA) algorithm was used to identify likely disturbance. Image stacks consisting of two scenes (one leaf on and one leaf off) per year (approximately 4,380 scenes for CONUS) for the years 2007-2011 were selected and processed to identify probably change. Outputs from these algorithms are combined with contributed events, other fire mapping products and ancillary data sources in a hierarchical process. The result is a unique, seamless data

product that is a convergence of data products for a time period that assigns severity, causality and confidence of disturbance for each pixel.

Corace, Greg

Greg Corace leads the Applied Sciences Program at Seney National Wildlife Refuge in Michigan's eastern Upper Peninsula and Kirtland's Warbler Wildlife Management Area in the northern Lower Peninsula. His main duties include working with others to conduct applied research, inventorying, monitoring, and land management on over 100,000 acres across the two land units. Greg holds Adjunct appointments at Wayne State University, The Ohio State University, Michigan Technological University, and Central Michigan University where he integrates tertiary education with refuge management.

Oral presentation, Thursday, 3:25 PM, B111

Biological Legacy Research and Management in Fire-Dependent Pine Forest Ecosystems of Northern Michigan

Natural disturbances often create biological legacies that play important roles as habitat for flora and fauna, provide a source of propagules and microbes for the recovering disturbed area, and otherwise affect ecological processes. We enhanced the underpinnings of biological legacy management within the context of fire-dependent pine forest management in northern Michigan via two different projects. First, we quantified spatial and structural characteristics of biological legacy patches (stringers) resulting from stand-replacing fire in jack pine (Pinus banksiana Lamb.) ecosystems. Second, we quantified the abundance and composition of natural and created snags within mixed red pine (P. resinosa Ait.) and eastern white pine (P. strobus L.)–dominated forests. Using a chronosequence of aerial imagery for 54 wildfires from 1973 to 2009, we found stringers occurred in all jack pine fires >1000 ha, in one-third of fires >80 ha, but never in fires <80 ha. Stringers were typically composed of many small, well-aggregated patches that represented 3–14% of the area within a given wildfire perimeter. In mixed-pine forests, data from 85- 500-m2 plots representing reference (benchmark) and altered (harvested, altered fire regime) conditions showed that the only snag variables that differed between plot types were mean snag basal area, which was greater in altered plots (Student's t-test, p = 0.04), and mean percent total basal area of snags (greater in reference plots, p = 0.06). Data from three treatments (girdling, fire, and topped) for creating snags from live trees suggested that the influence of predictor variables on decay class development after four years of the resulting snags varied by species and treatment. The findings from these studies are being applied to management focused on jack pine plantations for endangered Kirtland's warbler (Setophaga kirtlandii Baird) breeding habitat at Kirtland's Warbler Wildlife Management Area and mixed-pine restoration at Seney National Wildlife Refuge.

Cortés Montaño, Citlali

Citlali Cortés Montaño, Ph.D. Postdoctoral Researcher, Legado para la Sostenibilidad, Tecnológico de Monterrey Professional interests include conservation in the borderlands of NW México and the US SW. Dissertation research concerning old-growth forests in NW México has led to one (in press) publication in Ecosphere as first author about ecology and history of reference sites in Chihuahua, México.

Oral presentation, Wednesday, 1:40 PM, C120

Old-growth forests of northwestern México: linking history, overstory structure and fire disturbance

Relict old-growth sites with uninterrupted fire regimes provide a unique opportunity to study reference conditions that can help guide conservation and management of systems that have been changed by human-induced disturbances like logging, grazing, and fire suppression. The Sierra Madre Occidental (SMOc) holds the largest continuous area of temperate forests in México, but few of these retain old-growth characteristics. We studied old-growth forests at high elevation (>2200 meters) in Mesa de las Guacamayas, a range at the northern end of the SMOc in Chihuahua, ~100 km south of the border. We measured the structure and composition of the overstory and collected increment cores and fire scars to reconstruct age and fire histories at four study sites. Dominant canopy species were in the Pinaceae, the subcanopy was formed of oaks and other broadleaved species. The oldest trees established in the mid 1700s, and their fire histories indicate that frequent fires that burn at least once every decade are part of their disturbance regimes. Age distributions showed recruitment to the canopy over the past ~250 years, while fires in the four sites recurred every 6-12 years. Historically, climate was a driver of fire in this mountain range, but human intervention appears to have led to a ~60 year interruption in the second half of the 20th century at three of the study sites, a period associated with increased tree establishment, especially by broadleaved species. However, one site maintained uninterrupted fire frequencies and showed continuous tree establishment, consistent with the self-reinforcing role of frequent fire in regulating live and dead fuels. Remnant old-growth forests such as these are becoming increasingly rare in the SMOc, and the biodiversity and ecological processes that they support are

highly threatened. Their conservation must be made a priority, incorporating frequent fire to maintain these important habitats.

Cottrell, Stuart

Dr. Stuart Cottrell is an associate professor in the Department of Human Dimensions of Natural Resources at Colorado State University whose research and teaching focus on sustainable tourism development and protected area management in EU protected areas. He completed his PhD at Penn State University and taught at Wageningen University in the Netherlands for 6 years prior to coming to CSU in 2004. He has published 30+ refereed journal articles and co-editor of a recent book, "Sustainable Tourism & The Millennium Development Goals: Effecting Positive Change" which demonstrates how sustainable tourism can assist in supporting and meeting the goals set forward by the Millennium Development Goals.

Oral presentation, Tuesday, 3:50 PM, B115

Residents Perceptions of Mountain Pine Beetle impacts on wildland fire management in Northern Colorado and Southern Wyoming

We examined public perceptions of the mountain pine beetle's (MPB) impact on wildland fire management in northern Colorado and southern Wyoming. Households in counties adjacent to three study areas were the target of this social research in 2011/2012. These locations cover the area most impacted by the MPB outbreak in the region and allowed comparisons with previous research on related subjects. Results suggest that respondents viewed prescribed fire favorably and that they understand the natural role of fire on the landscape. While results suggest respondents support management of forest conditions to decrease the effects of a wildfire, they don't feel that individuals have a right to expect their home to be protected from fire by land managers, nor do they agree with restricting home building near national forest land. Findings should assist forest managers with the development of management actions and communication strategies.

Coughlan, Michael

Michael R. Coughlan is a PhD candidate in the department of anthropology at the University of Georgia. Michael's research interests currently focus on the historical, social, and ecological dynamics between fire, land use intensity, and landscape. For his dissertation Michael conducted ethnographic and ethnohistorical research on fire use practices with Basque shepherds in the French Western Pyrenees. Michael is funded by an EPA STAR (science to achieve results) graduate fellowship and has co-authored an article on transdisciplinary fire ecology recently published in the International Journal of Wildland Fire.

Oral presentation, Wednesday, 11:00 AM, C126

Historical human-fire-landscape dynamics in the French Western Pyrenees: A Bayesian weights of evidence approach.

This paper presents historical ecological research on human caused, low severity fires in the Pyrenees Mountains of Southwestern France. I used an ethnographically informed Bayesian weights of evidence approach to model the spatio-temporal dynamics of pastoral fire use practices from 1830 to 2011 for a mountain village territory in the Basque portion of the Pyrenees. Bayesian statistics are useful for understanding complex socioecological interactions because the method integrates diverse forms of evidence and their associated uncertainties directly into the analytical process. I show how historical, ethnographic, and environmental data can be incorporated into a single analysis through the use of a Bayesian weights of evidence GIS application. Results indicate that social and ecological forces interacted to produce a landscape mosaic dependent on the preferential use of fire to meet changing land management goals. From about 1860 onward, farming households expanded their landholdings while family sizes contracted. Over the same time period, Bayesian probabilities for fire use display an increase on pasturelands and a decrease on woodlands. These results suggest that a net increase in wooded area was at least partially associated with the increasing preference for pastures more conducive to fire management. Modeling the historical ecology of low severity fire requires attention to the landscape itself, the cultural practices of using and burning landscape, and the socioeconomic systems within which those practices are embedded.

Cronan, James

James Cronan PhD Student University of Washington, Seattle WA My research interests are focused on plant-disturbance interactions in fire-adapted environments and I have been lucky enough to work on research across North America. Prior to beginning my dissertation work I investigated the relationship between stand development and fire behavior in boreal forests of interior Alaska and developed a spatially explicit landscape-fire model to examine how variation of fire regimes impacts patch distribution in the Cascade Mountains of the Pacific Northwest. My dissertation work is being sup-

ported by the Pacific Wildland Fire Sciences Lab in Seattle, WA. Additionally, I am interested in the effectiveness of restoration projects at smaller scales in urban and suburban environments.

Oral presentation, Tuesday, 11:00 AM, C126

Effect of burn season on surface fuel dynamics in mesic longleaf pine flatwoods in northwest Florida

In the southeastern United States large public landholders have well established prescribed fire programs that replicate the natural fire rotation of fire-dependent ecosystems. Most acreage is burned during the winter when weather conditions are more amenable, however it is widely accepted that most acreage historically burned during the growing season. As a response to this departure from the natural fire regime, season of burn has been the frequent subject of research aimed primarily at measures of community ecology. To date, no studies have examined the impact season of burn has on the fuel life cycle in pine savannas. This research was proposed to address this question. Our objectives were to test for the effect that season of burn (dormant vs. growing season) has on the surface fuelbed and associated potential fire behavior for the period of a natural fire cycle (3 years) in a common pine savanna type (mesic flatwoods). A total of 16 sites were split between dormant and growing season burns at two locations in northwestern Florida. A suite of prefire, in situ fire, and postfire measurements were collected to assess fire behavior, weather and fuel dynamics. Sites were sampled at one year intervals over the course of the fire rotation to record fuelbed development. ANOVA tests will be used to test for effects of season and location. Multivariate statistical methods will be used to determine patterns among sites and relationships with environmental variables that may influence fuel dynamics.

DeFalco, Lesley

Dr. Lesley DeFalco is a Research Plant Ecologist for the US Geological Survey, Western Ecological Research Center. During 22 years as a scientist in the Mojave Desert, she has completed 30 publications focused on Invasive Species Ecology, Arid Land Restoration, and Threatened and Endangered Species Ecology. She currently serves as an independent science advisor for the Desert Renewable Energy Conservation Plan and as an advisor for the Desert Tortoise Recovery Implementation Team.

Oral presentation, Wednesday, 11:25 AM, B115

Recovery and Rehabilitation of Desert Tortoise Critical Habitat in the Northeast Mojave Desert

Long-term studies of post-fire recovery are lacking for Mojave Desert shrublands, and few landscape-level success stories are available for guiding management of burned habitat for sensitive species. Approximately 75,000 acres (4.8%) of critical habitat for the desert tortoise (Gopherus agassazii) burned during the unprecedented 2005 and 2006 wildfire seasons in the northeast Mojave Desert. While much of the creosote/bursage/Joshua tree and mixed blackbrush shrublands burned for the first time during these recent fires, other shrubland areas re-burned following fires in recent decades. We expected these contrasting burn scenarios to result in different habitat quality for the desert tortoise. We annually monitored the natural recovery and re-vegetation success across a network of burned/unburned sites in southern Nevada and northwestern Arizona since the 2005/2006 fires. Re-seeding and herbicide application aims to re-establish essential shrub cover and herbaceous forage in tortoise habitat following wildfire. Sites that burned multiple times depleted perennial cover and forage species for tortoises than sites that burned once. Recovery of shrublands in repeatedly-burned tortoise habitat has been limited because seed banks are less abundant, have low diversity, and are dominated by non-native brome grasses. In contrast, once-burned habitat still provides short-term structure for tortoises (e.g., dead creosote bush and Joshua trees), and based on perennial frequency and density, is responding to seeding and herbicide treatments with significant treatment effects following treatment implementation. Even though seeded habitat appears visually similar to unseeded habitat, a continued trajectory of higher plant establishment in treated once-burned habitat implies that managers prioritize limited resources to those areas, and more intense management is recommended for repeatedly-burned habitat.

Defossé, Guillermo

Guillermo E. Defossé is a University of Patagonia professor of Forest Ecology, and researcher at the Patagonian Forest Research and Extension Center in Esquel, Province of Chubut, Argentina. He holds a degree as an Agronomist Engineer (1979), earned at the University of La Plata in Argentina, and a MSc. in Range Sciences (1987) and a PhD in Forestry (1995), both earned at the University of Idaho in the United States. His main research interest is in range and forest fire ecology and management, productivity of rangelands, forest restoration, and CO2 emissions mitigation through forest practices. He has directed or co-directed 6 PhD dissertations and 7 MSc thesis, and published over 50 refereed publications and about a hundred technical reports in these areas of interest.

Oral presentation, Wednesday, 1:40 PM, B111

The doctoral program on fire ecology and management   promoted by the University of Patagonia in Argentina

During the implementation of the European-based project Fire Paradox, a group of fire scientists conceived the idea of developing an educational program specifically devoted to fire science. The idea matured during the development of the project, in which 37 institutions of 17 countries shared research, knowledge, local experiences, and socio-cultural visions of wildfire. Among the recommendations of the project, there was a general consensus about the need to deepen the scientific and managerial aspects of fire in different natural and man- modified ecosystems. Another recommendation was the necessity to broaden this knowledge by incorporating, through educational and research programs, the socio-cultural aspects of fire from different cultures, regions and countries. To meet with these objectives, a first proposal was presented to the UE by 5 universities of Europe, USA and Argentina. The project was not funded, but the idea remained, and in 2010-2011, the University of Patagonia took the lead to implement it in Patagonia. The general objective of the program is to "offer a doctoral degree comprising academic and research aspects of fire ecology and management in natural environments (rangeland, forest, and wildland-urban interface areas), including the ecological restoration of fire-disturbed ecosystems". After completion of the program, the graduates will be capable to understand the role of fire in different ecosystems, and to program, plan, and execute research in all aspects of fire science, including sociological, cultural and communicational aspects. The program will strengthen the skills of the doctorates by teaching them to learn and be fluent in one or two languages besides their native tongue. An international body of professors will be the faculty members of the program. Up to the present, the program has been approved by the authorities of the University of Patagonia, waiting for its final accreditation by the Ministry of Education of Argentina.

Delaney, Matt

Matt DeLaney is a student at the University of Montana.

Oral presentation, Thursday, 3:50 PM, C126

Experiential learning at the University of Montana

Students seeking a career in wildland fire management often find it difficult to balance academics and professional development. The western wildfire and prescribed fire seasons conflict with fall classes, making it difficult for students to stay on long enough to learn the different aspects of fire management or work on professional qualifications. The University of Montana addresses these problems through a variety of experiential learning opportunities, primarily through the Georgia Prescribed Fire Practicum. The practicum is a two-week, three credit winter session course held in Baxley, Georgia in partnership with The Nature Conservancy. It provides students on-the-ground experience in prescribed fire implementation, fire ecology, and leadership. In addition to the practicum, the University of Montana provides other prescribed fire opportunities at the Lubrecht Experimental Forest and with the Lolo National Forest. Essential field skills such as orientation skills, plant identification, and forest measurements are taught at the University's two-week long Natural Resource Measurements Camp and through the University's forestry curriculum. Through these opportunities the University of Montana is providing skills necessary for a successful career in wildland fire management.

DellaSala, Dominick

Dr. Dominick A. DellaSala is an internationally renowned author of over 150 technical papers, including the award winning "Temperate and Boreal Rainforests of the World." Dominick has given plenary and keynote talks ranging from academic conferences to the United Nations. He has appeared in National Geographic, Science Digest, Science Magazine, Time Magazine, Audubon Magazine, National Wildlife Magazine, High Country News, Terrain Magazine, NY Times, LA Times, USA Today, Jim Lehrer News Hour, CNN, MSNBC, "Living on Earth (NPR)," and several PBS documentaries. He received conservation leadership awards from the World Wildlife Fund in 2000 and 2004, the Wilburforce Foundation in 2006. His rainforest book received an academic excellence award in 2012 from Choice magazine, one of the nation's premier book review journals.

Oral presentation, Wednesday, 1:15 PM, B112

The role of fire mosaics in shaping forest ecosystems: do high severity fires produce "moonscapes?"

Fire has sculptured ecosystem dynamics in western landscapes for millennia. Most fires, even severe ones, generate coarse grain patchiness, and the resultant mosaic of different fire severities is associated with high levels of beta diversity, including the provision of habitat for rare species. Mixed severity fire, including large and small patches of high severity, also

is associated with biologically rich and underappreciated early seral stages with levels of alpha diversity and keystone biological structures (snags - legacies) higher than even the more celebrated late-seral stages of succession. I will draw from examples in different fire events, most notably the Biscuit fire of 2002 in southwest Oregon, to show how fire events can be an important driver of diverse and biologically rich landscape processes. From the standpoint of a black-backed woodpecker or other fire-adapted species, fire is not a disaster but an agent of habitat restoration if not altered by post-fire logging. Efforts to suppress large fire events that may otherwise be part of the natural ecosystem dynamics of a region may result in novel ecosystems in terms of highly altered species composition and ecosystem processes. In particular, climate change poses unique challenges to managers regarding how best to balance restorative actions based on historical baselines (back-casting) with efforts to build resilience to climate change (forecasting). Managers choosing to work with appropriate wildlands fire - which includes let burn policies - may wish to manage post-fire landscapes with a light touch, particularly if fires burned in areas with high ecological integrity (e.g., roadless, Wilderness, parks). Adaptive management and careful monitoring is needed to better ensure that intensive actions aimed at restoration are truly restorative and allow species to adapt to multiple perturbations from climate change and land-use pressures.

Dennison, Philip

Dr. Philip Dennison is an Associate Professor in the Department of Geography at the University of Utah. His research interests include remote sensing of vegetation physiology and phenology, remote sensing of fuels and wildfire, imaging spectroscopy, and fire danger modeling.

Oral presentation, Wednesday, 1:15 PM, C120

Remote monitoring of age-related seasonal variation in live fuel moisture content of lodgepole pine and big sagebrush

Live fuel moisture (LFM) varies seasonally, with plant aggregated fuel moisture reaching peak values during the emergence of new growth and then declining through the summer and fall. New and old growth can exhibit differing seasonal LFM trends, resulting in potentially biased LFM estimates from field sampling and remote spectral measurement. Over the summer of 2012, lodgepole pine needles and big sagebrush leaves were sampled at four sites near Missoula, Montana, USA. LFM was determined for new and old lodgepole pine needles, while only new leaves were measured for big sagebrush. For both needle and leaf samples, a lab spectrometer was used to determine spectral reflectance and transmittance. Multiple branch-level field reflectance spectra of lodgepole pine, and canopy-level reflectance spectra of big sagebrush, were acquired at the four sites. LFM for new pine needles and sagebrush leaves decreased over time, while old pine needles produced in previous years maintained stable LFM throughout the sample period. During the period of LFM decline, new growth exhibited large spectral changes associated with water and chlorophyll absorption. For lodgepole pine, both LFM and spectral indices converged towards old growth values as new growth hardened over the summer. Potential impacts of seasonal LFM variability in new and old growth on remote monitoring of fuel moisture content will be discussed.

Densmore, Valerie

Dr. Valerie Densmore, PhD Student, Faculty of Agriculture and Environment, University of Sydney, Sydney, NSW, Australia I am in the process of obtaining a second research PhD. I originally pursued a PhD in Neuroendocrinology, but keeping ecology and restoration as a hobby didn't satisfy my passion and curiousity for these subjects. Thus I find myself quite happily in graduate school a second time pursuing my dream to investigate ecological cycles of restoration through fire.

Oral presentation, Thursday, 3:50 PM, C120

'WattleItBe?' - The role of environmental factors in determining distribution of Acacia spp. after bushfire

Fire, along with climate and soil has modulated the evolution of Australian plants and represents a central architect shaping native plant communities. Woody legumes, such as Acacia spp., use heat to stimulate dormant seed, thus moderate- or high-intensity fires can trigger their germination. However, the resulting population densities display a patchy distribution following bushfire, often varying several orders of magnitude over small distances. The reasons behind this are unknown. Woody legumes are able to fix atmospheric nitrogen, which helps counter-balance nitrogen volatilised from soil during fire, but may also promote higher productivity, leading to greater fuel loads. Understanding factors that underlie the variable population densities of these species may inform models of future fire hazard. Therefore, the aim of this study was to characterise soil properties and climate and geographic factors that significantly influence the densities of woody legumes following bushfire. In February 2009, the 'Black Saturday' bushfires burned over 90,000 hectares of National Parks in the state of Victoria. Six representative species of woody legumes that germinated post-fire were identified growing at two to three densities. Physical and chemical characteristics of soil (0-10 cm depth) including pH, water holding capacity, and

nutrient content were measured for each site. Rainfall, temperature, and solar incidence data were obtained from nearby weather stations. A one-second (30 m) digital elevation model was obtained to enable analysis of geographic factors using ArcGIS software. Ordinal logistic regression was used to analyse variables with interactions that best fit the population densities of the target species. Many of the elucidated factors related to obtaining energy and scarce nutrients. I will discuss the factors that may help predict distributions of woody legumes following bushfire and the resulting implications for how these species and landscape features may interact to influence future fire hazard.

Dewar, Jacqueline

Jacqueline Dewar is currently a Research Assistant to Dr. Mike Flannigan in the Department of Renewable Resources at the University of Alberta, working on various projects relating to fire management, fire ecology, climate and vegetation throughout western Canada. In December 2011 she completed her Masters of Science through the School of Natural Resources at the University of Arizona under the supervision of Dr. Donald Falk. Upon graduation from the University of Winnipeg, she earned the Silver Medal in Sciences and the Gold Medal in Geography, as well as a prestigious Postgraduate Scholarship from the Natural Sciences and Engineering Research Council (NSERC) of Canada. Jacqueline's primary research interests include dendroecology, fire history, fire ecology, forest and fire management, and wildfire operations.

Oral presentation, Tuesday, 1:15 PM, B112

Multi-scale analysis of fire regimes in montane grassland-forests of the Valles Caldera, New Mexico, USA

Montane grasslands are distributed across southwestern North America, but there is little quantitative study of their dominant disturbance regimes despite their biological and economic value. The forest-grassland ecotones in these systems are particularly dynamic domains where disturbance, topography, and edaphic factors regulate plant communities. We reconstructed historic fire regimes at multiple spatial scales in ponderosa pine and mixed-conifer forests surrounding the "valle" grasslands in the Valles Caldera National Preserve in northern New Mexico, USA. Temporal and spatial patterns were compared utilizing historical fire patterns recorded by trees to (1) assess geographic patterns in forest and grassland fire regimes, (2) determine the climate patterns that entrain the ecotonal fire, and (3) assess 20th century anthropogenic impacts upon the historic fire regime. Using a spatially-explicit sampling design, we cross-dated 388 fire-scarred samples from the grassland-forest ecotone surrounding nine valles. We identified 181 fire years from an adequate sample size from AD 1601-1902. Results confirm pre-1900 occurrence of high frequency, low-severity surface fires over multiple centuries (MFI = 2.52 year). In some fire years, synchronous fires burned across the grasslands and into the surrounding forests over much of the ~40,000 ha Caldera (>25% of total sites burning at ~10.5 year intervals), indicating dominant top-down climate control. In other years, fires burned relatively small portions throughout the Caldera (between 10-25% of total sites at ~6 year intervals), creating asynchronous burn patterns suggesting stronger bottom-up controls. Fires occurred 21 times in consecutive years during the period of record, primarily during multi-year drought episodes as reflected in Palmer Drought Severity Index (PDSI). Superposed Epoch Analysis (SEA) revealed widespread fire years typically occurred after a 2-year lag of significantly greater wet/cool conditions, in contrast to local and non-fire years. Results will assist planning grassland-forest restoration and reinstituting more sustainable regimes for prescribed and natural fire management.   Key words: fire regimes, montane grasslands, ecotone, ponderosa pine, top-down controls, bottom-up controls, synchrony, spatial analysis

Dey, Daniel

Dan Dey is Research Forester and Project Leader for the U.S. Forest Service, Northern Research Station Unit for the Sustainable management of Central Hardwood Ecosystems and Landscapes. His expetise is in silviculture with an emphasis on sustaining desired forests through successful regeneration, and restoration of fire-dependent ecosystems.

Oral presentation, Tuesday, 11:00 AM, B116

Restoring oak forests and woodlands using modern silvicultural analogs to historic cultural fire regimes in eastern North America

For thousands of years, the frequency and intensity of fire in eastern North America has been intricately linked with humans and climate. Low intensity fires readily reduced the density of smaller woody stems (<15cm in diameter). More intense fires removed large diameter trees. In a land where rainfall and soils are capable of supporting tree growth everywhere, it was the fire regime at any one location that determined the composition and structure of vegetation, and, hence the distribution of forest, woodland, and savanna. Frequent low intensity fires favored hardwood species that are able to regenerate through vegetative sprouting such as the oaks, reduced fire-sensitive hardwood and conifer species, and created woodland structures. In drought years, severe fires determined the distribution of open woodlands and savannas on the

landscape. Oak was promoted in savannas and woodlands because sufficient light reached the forest floor for growth of oak reproduction. Occasional longer fire-free periods allowed oaks to recruit into the overstory. Infrequent fire promoted forests with complex structures dominated by shade tolerant species that out-competed the more light demanding oaks. Today, the dominance of oak in eastern North America is due largely to a long history of fire acting in combination with other disturbances. But, oak regeneration failures are widely reported and succession to other species is common since fires have been suppressed over the past 50 years. Restoration of oak forests and woodlands is possible but requires innovative combinations of traditional silvicultural regeneration methods and practices, including prescribed burning.

Dicus, Christopher

Dr. Christopher A. Dicus is a Professor of Wildland Fire & Fuels Management at California Polytechnic State University in San Luis Obispo, CA. He serves on the Board of Directors of the Association for Fire Ecology and was awarded the 2011 Outstanding Researcher Award for the College of Agriculture, Food, and Environmental Sciences at Cal Poly.

Oral presentation, Wednesday, 2:30 PM, B116

Changes to surface fuels and potential fire behavior following selection harvest in a coast redwood/Douglas-fir forest

I quantified changes to surface fuels and subsequent potential fire behavior for three years on 31 permanent plots following a selection harvest in a coast redwood (Sequoia sempervirens) and Douglas-fir (Pseudotsuga menziesii) forest in the Santa Cruz Mountains of California.   The harvest employed two types of skidding (cable and tractor) and was followed by a lop-and-scatter treatment for slash >10.2 cm. I also created custom fuel models and modeled fire behavior at the stand level with BehavePlus (v. 5.0) and at the landscape level with FARSITE (v. 4.1).   In the first year following harvest, surface fuel loading significantly increased in 1-hr (<0.64 cm diamter), 10-hr (0.64-2.54 cm), 100-hr (2.54-7.62 cm), 1000-hr sound (>7.62 cm), and 1000-hr rotten timelag fuel categories. Further, litter depth and duff depth also significantly increased in the first year following harvest. Increases to all of surface fuel categories, excluding 1000-hr rotten and duff depth, were significantly correlated to the amount of volume removed during the harvest. Skidding technique did not significantly impact changes to any fuel category. All fuel categories returned to pre-harvest levels by the second year following harvest. Like fuel dynamics, stand-level simulated flame length and rate of spread significantly increased in the year immediately following harvest, but returned to pre-harvest levels by the second year. At the landscape level, simulated fire size doubled in the first year following harvest, but again returned to pre-harvest levels by the second year.   Fire in the local area has increasingly become more frequent and damaging in the last decade due to drought and increased anthropogenic ignitions, leading to greater concerns regarding impacts of harvesting on escalated fire risk. This research demonstrates that fire hazard is indeed elevated in the first year following a selection harvest in this forest type, but that the increased hazard is relatively short-lived.

Dicus, Christopher

(See biographical information, above.)

Oral presentation, Thursday, 1:15 PM, B118

Impacts to fire behavior and ecosystem services following fuel treatments in the WUI

To best insure sustainable communities in the wildland urban interface, management strategies for a give area must be developed that minimizes both fire risk and also the residual impact to ecosystem services that distinct vegetation types provide. This presentation discusses ongoing research into how various WUI fuel treatments in shrub- and forest-dominated ecosystems simultaneously impact potential fire behavior and various ecosystem services provided by vegetation. In mixed conifer forest in the Klamath Mountains of northern California, stand-level analysis showed that after one year following treatment, all treatment types (including fire only, thin only, thin+fire, and thin+pile+burn) significantly reduced simulated fireline intensity below untreated control stands. Fire only and thin+fire provided the greatest effect due to those treatments simultaneously increasing canopy base height and reducing fine dead surface fuel loading. Thin+fire was the only treatment that significantly lowered annual carbon sequestration and PM10 air pollutant removal below the untreated control. All treatments impacted fireline intensity for about 10 years. All treatments other than thin+fire recovered onsite carbon storage within 5 years. A landscape-level simulation analysis in the same study area investigated multiple treatment types with increasing percentage of the landscape being treated. All treatment types significantly impacted probability of fire occurrence, fireline intensity, and carbon storage across the landscape. After treating 20% of the landscape, few additional changes to fire occurrence and behavior were experienced. While fuels management was the focus of the current research, there is a need for a holistic approach to fire management in the wildland-urban interface that includes construction materials and design, community planning, fire suppression effectiveness, and others.

Dillon, Gregory

Gregory K. Dillon is a spatial fire analyst with the USDA Forest Service's Fire Modeling Institute in Missoula, MT. Prior joining FMI in 2011, Greg was the team lead for potential vegetation mapping on the National LANDFIRE project, and also worked on research focused on examining the influences of topography and climate on burn severity in the western U.S. He has a B.S. in Geography from James Madison University (Harrisonburg, VA), and an M.A. in Geography from the University of Wyoming. Information about publications and current projects can be found at: http://www.firelab.org/staff-directory/153.

Oral presentation, Wednesday, 3:50 PM, C125

Thresholds for classifying the RdNBR across the western United States

Two data products derived from satellite imagery have emerged as the preferred measures of landscape change due to wildland fire: the differenced Normalized Burn Ratio (dNBR) and Relative differenced Normalized Burn Ratio (RdNBR). While the raw values of both indices are useful for addressing some questions, many users prefer to work with data classified into discrete categories of severity. In the United States, the Monitoring Trends in Burn Severity (MTBS) project produces and distributes both indices, as well as a classified version of the dNBR. However, a consistently classified version of the RdNBR is not available, despite the RdNBR's advantages in certain circumstances. As part of a larger project called FIRESEV, my objective was to develop a set of thresholds for classifying the RdNBR in both forest and non-forest settings for all locations in the western United States. Using a dataset of over 3,000 field plots of composite burn index (CBI) acquired from a variety of sources, I evaluated the relationship between CBI and RdNBR with four different regression models reported in earlier studies. I developed models separately for forested vs. non-forested plots, testing different geographic aggregations of the data and extended vs. initial assessments. For forest settings, non-linear regressions always had the best fit (extended assessment R2 = 0.42 – 0.78 for different geographic regions; 0.61 for all plots combined). In non-forest settings, best fit sometimes came from a simple linear model (extended assessment R2 = 0.36, all plots combined), and sometimes from a non-linear model (initial assessment R2 = 0.29, all plots combined). In this talk I will present insights gained from this analysis, as well as thresholds calculated from the regression models that may prove useful to others looking to classify the RdNBR data.

Doherty, Michael

Michael Doherty is a fire ecologist with CSIRO Ecosystem Sciences in Canberra, Australia. He graduated with an Honours Degree in Science from the University of Sydney in 1986, majoring in plant ecology. For the past 25 years he has worked on a range of vegetation survey and vegetation management projects for local, state and federal governments both in Australia and overseas and has extensive experience in survey design, vegetation monitoring and the analysis of ecological data. He has been with CSIRO since 1991 and is currently undertaking a part-time PhD at the Australian National University on the effects of fire on montane plant communities, focussing on relationships between fire severity and plant species richness, plant community composition and vegetation structure.

Oral presentation, Thursday, 3:50 PM, B115

Fire Severity and Plant Community Dynamics in Montane Ecosystems in the Australian Alps

Extensive tracts of eucalypt-dominated subalpine, montane and lowland forest and woodland occur in the Australian Alps of south eastern Australia. Large high intensity fire events in these ecosystems are infrequent and are primed by drought and driven by extreme fire weather. In January 2003, lightning-ignited fires burned through more than 1.5 million hectares of land in the ACT, NSW and Victoria, predominantly in subalpine and montane ecosystems. More than half of the area burned experienced extremely high intensity fire and many areas which burned in 2003 had not experienced high intensity fire since the extensive fires of 1939, or earlier.   The impact and long term effects of such fires on vegetation composition, vegetation structure and plant species richness are poorly understood in the Australian Alps. The 2003 fire event has created an opportunity to undertake fundamental research on the role of large, infrequent high intensity fires in shaping long term landscape patterns and ecosystem processes across a wide spectrum of plant communities experiencing a range of fire intensities.   Using pre and post fire data from permanent monitoring sites stratified by plant community and by fire severity, differences between low and high severity fire in relation to species richness, plant community composition and vegetation structure were investigated. My results show that: a) plant species richness response is highly variable; b) plant communities exhibit only small differences in compositional change and recovery between low and high severity fire; c) sites exhibit high 'tenacity' and move rapidly back toward pre-fire composition, remaining nested within vegetation types which remain distinct from one another after disturbance; d) structural recovery exhibits the clearest and greatest difference between low and high severity fire.   I will discuss these results and also the mechanisms underlying the observed resilience of these plant communities, in relation to fire and conservation management.

Donato, Daniel

Daniel Donato, Research Associate at the University of Wisconsin-Madison and Oregon State University, has studied forest disturbance ecology in the western US for 15 years.

Oral presentation, Tuesday, 3:50 PM, B117

Bark beetle effects on fuel profiles and wildfire severity in Douglas-fir forests of Greater Yellowstone

Consequences of bark beetle outbreaks for forest wildfire potential are receiving heightened attention, but little research has considered ecosystems with mixed-severity fire regimes. Such forests are widespread, structurally variable, and often fuel-limited, suggesting that beetle outbreaks could substantially alter fire potentials. In two related studies, we evaluated how outbreaks of the Douglas-fir beetle affect 1) fuel profiles over post-outbreak time, and 2) the severity of a recent large wildfire, in lower montane Douglas-fir forests of Greater Yellowstone, USA. In the first study, we quantified changes in fuel structure over 30 years of post-outbreak time, comparing these changes to the range of fuel profiles present in the absence of beetle disturbance. After accounting for background variation, there were significant reductions in canopy fuel mass and continuity (beginning in and continuing beyond the red-needle stage), and relatively few detectable changes in surface fuels. Outbreak effects on fuels were comparable to background variation in stand structure. The gradual and partial nature of beetle outbreaks mitigated some commonly expected changes to fuel profiles (canopy moisture reduction, surface fuel accumulation). In the second study, we sampled 85 plots in a large wildfire (27,200 ha) that burned in 2008 in an area where beetle outbreaks had occurred ~3-5 years prefire, to determine whether fire severity and postfire tree establishment were influenced by prefire beetle activity. We found no significant relationship between fire severity and prefire beetle outbreak severity; fire severity was instead largely driven by topographic position and weather at the time of burning. Postfire conifer seedling density was strongly related to proximity to live trees that survived both disturbances. These studies suggest that wildfire potentials and effects in lower montane forests are driven as much or more by background structural variation, along with weather and topography, than by prior bark beetle outbreaks.

Douglas, Jim

Jim Douglas currently serves as the Senior Advisor to the Department of the Interior Deputy Assistant Secretary for Public Safety, Resource Protection, and Emergency Services. In that role he leads various initiatives on policy, organizational improvement, management efficiency, and information technology services. Previously he has served as the BLM Assistant Director for Fire and Aviation, Deputy Director of the Office of Wildland Fire Coordination, Director of Response Policy in the White House Homeland Security Council, and various fire and emergency management leadership positions in Interior. He was a leader in development of the 1995/2001 federal fire policies and development of national incident response policy, among other initiatives.

Plenary talk, Friday, 9:35 AM, Ballroom

The Department of the Interior Strategy for Policy Implementation

The 1995 Federal fire policy, along with the 2001 update, continue to provide a solid foundation for federal fire management – recognizing the importance of the response to wildfire, adapting communities to wildfire threats, and recognition of the integral role wildland fire to improve the health of the land. The 2009 guidance for implementation of Federal fire policy recognizes that use of management tools such as prescribed fire and fuels management to reduce the impacts of wildfires on local communities and increase land health is not sufficient in itself. We need to continue to wisely manage our response to wildfires to achieve land management objectives, to reduce risk to the public and firefighters, and to protect high-value assets in a cost-effective manner. Managing wildland fire for multiple management objectives cannot be an exclusively federal undertaking. Federal lands are largely interspersed and adjacent with those under non-federal fire protection. Management actions federal agencies take have immediate and long-term consequences for neighboring jurisdictions. Taking a "national" not "federal" approach to fire management is critical for our success in reducing risks to communities, to improving long-term land health, and reducing firefighter and fiscal risk. This approach requires engagement with all partners, neighbors, and stakeholders early and often – well prior to smoke in the air. We need to better communicate why we choose to take various management actions to help the public understand the short-term tactical requirements as well as the long term consequences. The Cohesive Strategy is one tool for building the necessary social and political compact that will allow us to work effectively across agencies and landscapes. We will also need to continue to invest in better land management planning and decision support tools that allow managers to make wise decisions and the public to understand and support those decisions.

Dow, Christopher

Christopher was first introduced to Fuel and Fire Science studies during employment by the US Forest Service, Pacific Southwest Region, Davis under the supervision of Brandon Collins. During his tenure with the Forest Service, he participated in field fuel assessment studies, as well as working with programs such as ArcFuels, Flammap, FOFEM, Nexus, and BehavePlus in order to model fuel and fire effects across landscapes in the Plumas and Lassen National Forests. His experience using FOFEM led to his first publication, Fuel Treatment Impacts on estimated wildfire carbon loss from forests in Montana, Oregon, California and Arizona. This work has led to a Master's program, with further studies of fuel modeling and fire impacts in the western United States, as well as further work in carbon emissions from wildfire.

Oral presentation, Tuesday, 2:30 PM, C126

Impacts of landscape fuel treatment design on hazardous fire potential: a comparison of an actual fuel treatment network to a theoretical treatment design

Large-scale fuel reduction efforts are needed in many forests throughout the western U. S. to mitigate the potential for extensive losses of productive and mature forests from seasonal wildfires. However, there are a number of land management obligations and operational constraints that limit the placement and extent that fuel reduction treatments can be applied across many landscapes. Recent developments in fire behavior and fuel treatment modeling have made it possible to incorporate these constraints into theoretical fuel treatment planning. The Treatment Optimization Model (TOM) identifies the "ideal" areas to treat, such that fire spread across a landscape is minimized based on user-identified potential treatment areas. As an alternative to the intensive modeling procedures associated with TOM, there are examples of recent landscape fuel treatment projects in which the treatment arrangement was based largely on local knowledge and intuition. We used the theoretical treatments derived from the TOM module to evaluate the treatment effects on modeled landscape-level fire, and compared that to both the modeled fire effects based on the actual treated landscape, and a modeled untreated landscape. When averaged across the entire landscape, conditional burn probabilities for both treated scenarios were approximately half that for the untreated scenario in 2010. The fact that the modeled burn probabilities were considerably reduced in both treatment scenarios relative to the untreated scenario suggests that both the actual, and theoretical treatment designs, can be quite effective at reducing more problematic fire behavior, however, the theoretical treatment design seems to result in a more even reduction in burn probabilities across the landscape.

Drury, Stacy

Stacy Drury has been active in applied research for the past 20 years. He has worked for research organizations including the Fire and Environmental Research Applications (FERA), Instituto de Silvicultura e Madera (ISIMA), and the Missoula Fire Lab. Stacy has experience investigating fuel consumption, smoke emissions, and fire occurrence throughout North America. Stacy is the Senior Fire Ecologist at Sonoma Technology, Inc. Stacy's projects include Senior Science lead on the Interagency Fuels Treatment Decision Support System (IFTDSS), Co-PI on the Real Time Assessment of Fire Weather Accuracy project, and Senior Scientist on the Smoke Emissions Modeling Intercomparison Project (SEMIP).

Oral presentation, Thursday, 1:15 PM, C122

Uncertainty in Smoke Emissions Modeling: The Tripod Fire Case

As part of the Smoke and Emissions Model Intercomparison Project (SEMIP), estimates of wildfire size, fuel loadings, fuel consumption, and smoke emissions were compiled and compared for the 2006 Tripod Fire Area in north-central Washington. SEMIP is a multi-year collaborative effort to analyze and quantify variability, or uncertainty, in fire reporting, fuel loading, fuel consumption, and smoke emissions estimates. SEMIP is designed to quantify the uncertainty associated with estimates of fuel loading, fuel consumption, and smoke emissions, which vary depending on the models used in a step-by-step modeling pathway. The Tripod Fire case illustrated how uncertainties could be quantified at each modeling step. For example, fire size estimates obtained from sources such as the ICS-209 incident reports, helicopter-flown fire perimeters, and MODerate-resolution Imaging Spectroradiometer (MODIS) imagery varied widely. Fuel loadings estimated from fuel loading maps, including the Fuel Characteristic Classification System (FCCS) and the LANDFIRE project, were also highly variable, as were fuel consumption estimates made using Consume 3.0, the First Order Fire Effects Model (FOFEM 5.7), and the Monitoring Trends in Burn Severity (MTBS) maps. Smoke emissions estimates produced by Consume and FOFEM continued the trend of increasing divergence as model results using the same data inputs differed. The Tripod Fire case clearly showed that fuel consumption and smoke emissions estimates were dependent on the models used at each step of a modeling pathway. This paper discusses the results of the Tripod smoke emissions comparisons and provides some suggestions on how fire, fuels, and smoke managers can avoid increasing uncertainty in smoke emissions modeling.

Drury, Stacy

(See biographical information, above.)

Oral presentation, Wednesday, 11:25 AM, B116

The Interagency Fuels Treatment Decision Support System (IFTDSS): Current Software Tools and Data Available Online for Fuels Treatment Planning

The Software Tools and Systems Study was initiated by the Joint Fire Science Program (JFSP) and the National Interagency Fuels Coordination Group in March 2007 to address the proliferation of software systems in the fire and fuels treatment domain. In 2008, the Interagency Fuels Treatment Decision Support System (IFTDSS) software framework was designed to organize and manage the many software systems and data used for fuels treatment planning and to make these tools available to fuels treatment planners through a single user-friendly, web-based system. Since 2008, the IFTDSS development team at Sonoma Technology, Inc. has worked closely with the JFSP and other stakeholder groups to develop a flexible system to manage the software tools and data. This presentation will provide an overview of the current tools and data available for use within IFTDSS. At this time, software tools for assessing fire behavior and fire effects have been implemented in several workflows. Workflows are specific modules that provide software tools and data to support business needs for fuels treatment planning and management. Current workflows include prescribed burn planning, hazard analysis, risk assessment, fuels treatment location, and fuels treatment effectiveness.

Dunn, Christopher

Chris Dunn is a PhD Graduate Fellow at Oregon State University studying carbon dynamics in forest systems following fire and harvest disturbance in western hemlock forests of Oregon's Cascades. He earned his Bachelor of Science degree at Colorado State University in Forest Fire Science and Management and a Master's of Science in Forest Resources at Oregon State University researching coarse wood dynamics following fire disturbance in dry-mixed conifer forests. Prior to beginning his graduate studies he enjoyed a career in fire management in southwestern Oregon.

Oral presentation, Wednesday, 1:40 PM, B118

To Restore or Re-story: That is the Question?

Efforts are currently underway to restore forested landscapes on BLM lands in the Middle Applegate Watershed of southwestern Oregon. These lands were established following the O&C Lands Act of 1937 and have legal mandates to produce timber while simultaneously protecting watersheds, providing recreational resources and fulfilling conservation duties required by other statutes. A more comprehensive knowledge about disturbance history and forest developmental pathways are foundational to all planned management activities and debates about the relative merits of various restoration approaches trying to meet these mandates. We embarked on a disturbance history and stand development study to inform current and future restoration activities in the Middle Applegate Watershed. We determined current forest demographics by collecting over 2600 tree cores or cross-sections from conifer and hardwood trees across a systematic grid of 119 plots. We removed nearly 100 fire scars, spatially aggregated around 36 of these plots, to determine how disturbance history impacts stand development. We've classified the landscape into distinct ecological units based on stand characteristics, disturbance history and physiographic conditions using multivariate statistical analyses. Following European settlement fire frequency decreased significantly, resulting in increased densities and spatial extent of Douglas-fir at the expense of oak and other shade intolerant tree species. The continued homogenization of this landscape is fundamentally different than pre-settlement forest conditions and does not meet conservation or economic mandates established for these lands. We recognize that historical information is invaluable to our understanding of forest dynamics and restoration, but uncertainty in regards to future climate change and fire disturbance limits the applicability of restoring this landscape to pre-settlement conditions. Instead, we should consider creating a new story for this landscape that increases spatial heterogeneity and landscape diversity to improve ecosystem functioning so this landscape is more acceptant and resilient to anticipated future changes.

Duren, Olivia

Olivia Duren, Vegetation Ecologist/Botanist, Oregon State University (formerly), Tetra Tech Environmental Consulting (currently). After completing my Master's degree and a Faculty Research Associateship at Oregon State University, I joined an environmental consulting firm to lead rare plant surveys and map and characterize vegetation across the Columbia Basin, West Cascade, and Willamette Valley ecoregions of Oregon. This work has enabled me to perfect the essential skills of rattlesnake-jumping, cliff scaling, and log shimmying. My journal publications appear in Fire Ecology and Northwest Science.

Oral presentation, Thursday, 4:15 PM, C125

150 years of landscape-level vegetation change in southwest Oregon and the roles of environment and disturbance

Faced with landscapes degraded by fire suppression, logging, and grazing, land managers in the interior western US are attempting to restore habitat structure and function, often using assumptions about pre-suppression vegetation structure to define a target reference state. In the Klamath region of southwest Oregon, our understanding is poor of the nature of the landscape prior to widespread Euro-American influence, or the patterns and processes of vegetation change over time. We compared a General Land Office-based reconstruction of Euro-American settlement era (1850s) vegetation in interior valleys and foothills with modern vegetation interpreted from aerial orthoimages to determine patterns of vegetation distribution in both eras, trajectories of vegetation change, and environmental and disturbance factors related to these themes. We found that, while transitions at many sites are consistent with a decline in fire, fire suppression has not been the only major driver of landscape-level change in the past 150 yr.

Duren, Olivia

(See biographical information, above.)

Oral presentation, Thursday, 11:25 AM, B115

Fire suppression in southwest Oregon chaparral and oak woodland: same old story of woody species invasion? A look at community response to changing fire regimes and fuels treatments as restoration.

In the arid west, fire suppression is thought to have caused the invasion of many native woody species into degraded ecosystems. In the Klamath region of southwest Oregon, land managers are targeting chaparral shrublands and oak woodlands for fuels treatments in an effort to both reduce fire hazard, and to restore presumed pre-suppression vegetation structures and dynamics. While chaparral and oak communities are characteristic of southwest Oregon, the ecology of these vegetation types is poorly understood in the region, and the assumptions guiding treatment need and design are underpinned by ecological models developed elsewhere. Because chaparral and oak woodlands are relatively uncommon in this region, potential management missteps have implications for landscape-level diversity, as well as for sensitive wildlife species dependent on these habitats. What was the historic role of fire disturbance in southwest Oregon chaparral and oak woodlands, and how has the influence of fire changed over time? What can we decipher about historic vegetation structures, and how do these compare to the present? We studied age structure in chaparral and oak woodland to assess whether fire suppression has brought about the invasion of trees and shrubs as has been documented in other vegetation communities, and whether current fuels treatments are attaining restoration objectives of recreating pre-suppression characteristics.

Ellsworth, Lisa

Lisa Ellsworth Research Associate University of Hawaii at Manoa   Has just completed her PhD dissertation looking at improved prediction and management in fire prone grassland ecosystems in Hawaii

Oral presentation, Tuesday, 3:50 PM, C122

Improved prediction of live and dead fuel moisture in invasive Megathyrsus maximus grasslands in Hawaii with Moderate Resolution Imaging Spectroradiometer (MODIS)

The synergistic impacts of nonnative grass invasion and frequent anthropogenic fire threaten endangered species, native ecosystems, and managed land throughout the tropics. The invasive grass/fire cycle – a positive feedback between frequent anthropogenic fire and nonnative grass invasion – is now a reality in many tropical landscapes formerly occupied by native woody communities. This feedback has dramatically increased fire frequencies, typically with detrimental consequences for native plant communities. Models that predict site-specific fire behavior are an important component of fire prevention and management in these landscapes. Current models, however, do not accurately predict fire ignition or behavior (rates of spread, flame lengths) in Hawaii or elsewhere in the tropics. Specifically, available models do a poor job at predicting live and dead fuel moisture, which are key drivers of wildfire. To address this gap, we developed empirical models to predict real-time live and dead fuel moisture in nonnative Megathyrsus maximus grasslands in Hawaii from Terra-MODIS NDVI and EVI2 vegetation indices. MODIS-based live fuel moisture prediction was moderate ($R2= 0.46$) compared to in situ fuel moisture data from three sites on leeward Oahu, but outperformed the currently used National Fire Danger Rating System ($R2= 0.37$) and the Keetch-Byram Drought Index ($R2= 0.06$). Dead fuel moisture prediction was less robust ($R2= 0.19$). The empirical models developed here can be used by fire managers to improve real time, in situ fuel moisture prediction in guinea grass dominated ecosystems in Hawaii. More accurate fuel moisture prediction in nonnative grasslands

should greatly improve fire management in Hawaii, and can inform management in other tropical ecosystems dominated by similar nonnative grasses.

Endsley, K. Arthur

K. Arthur Endsley is a Research Scientist at the Michigan Tech Research Institute in Ann Arbor, MI, where he has created web-based mapping applications to address a variety of needs including transportation infrastructure assessment, aviation activities management and the dissemination of real-time monitoring data. Recently, he contributed to the development of OpenClimateGIS.org, a web framework for providing easy access to global and regional climate data for interdisciplinary use. He is primarily interested in geospatial analysis and visualization, machine learning, information retrieval, and image analysis for numerous applications, particularly environmental monitoring and mitigation. He is an active proponent of sustainable permaculture and open-source software development using web standards and open protocols for improving access to and accessibility of multi-sensor, multidisciplinary data.

Oral presentation, Wednesday, 3:25 PM, B111

Prescribed Burn and Wildfire Communication on Twitter: Identifying and Mapping with Data Mining Techniques

Data mining techniques have been applied to social media in a variety of contexts, from mapping the evolution of the Tahrir Square protests in Egypt to predicting influenza outbreaks. The Twitter platform is a particular favorite due to its robust application programming interface (API) and high throughput. The platform is similar in operation to the short message service (SMS), better known as "texting," available on cellular phones and the most popular means of wide telecommunications in many developing countries. In the United States, Twitter has been used by a number of federal, state and local officials as well as motivated individuals to report prescribed burns in advance (sometimes as part of a reporting obligation) or to communicate the emergence, response to, and containment of wildfires. These reports are unstructured and, like all Twitter messages, limited to 140 characters. Through internal research and development at the Michigan Tech Research Institute, the authors have developed a data mining routine that gathers potential tweets of interest using the Twitter API, eliminates duplicates ("retweets"), and extracts relevant information such as the approximate size and condition of the fire. Messages are geocoded from unstructured location information, allowing for prescribed and wildland fires to be mapped. Acreage burned, percent containment, and disaster response status are also relevant items extracted through tokenizing and tagging tweets. The entire routine is implemented in the Python programming language, using open-source libraries. As such, it is demonstrated in a web-based framework where prescribed burns and/or wildfires are mapped in real time, visualized through a JavaScript-based mapping client in any web browser. The practices demonstrated here generalize to an SMS platform (or any short text-based platform) and thus provide exciting opportunities for the cultivation of fire or other disaster alerts and response here in the U.S. and in the developing world.

Engert, Jan

Jan Engert is the Assistant Station Director at the US Forest Service Rocky Mountain Research Station in Fort Collins, CO. She directs the Science Application & Integration (SA&I) Program which is a knowledge transfer unit that provides leadership for the integration and use of scientific information in natural resource planning and management.

Oral presentation, Thursday, 2:05 PM, B110

Technology transfer and communication: From the developers and user communities in the 21st century

Recommendation 4 submitted to the Joint Fire Science Program Governing Board a decade ago stated that "Technology development, transfer, and communication need to be improved between developers and user communities". A decade ago computer technology had advanced to a point that allowed for development of complex prediction models for fire behavior and fire effects. Landscape level assessments had become possible through the development of Geographic Information Systems and remote sensing technology. This new technology was mainly available to researchers and scientists with limited use within the fire community. In this presentation we will discuss the many ways technology transfer and communication from developers to the user community has improved over the past decade. We will discuss ongoing challenges and opportunities for bridging the science/management interface as well as principles for effective science application and delivery. We will share lessons learned from the enterprises developed within the fire community to provide science-based tools, analysis and information to managers including the National Interagency Fuels Technology Transfer team, the Fire Modeling Institute, the Fire Research and Exchange System and others.

Enright, Neal

Professor Neal J Enright is a research Professor of Plant Ecology at Murdoch University in Perth, Australia. He is Editor-in-Chief of the international Springer Publications journal, Plant Ecology. His research focusses on the effects of fire and climate change on plants of mediterranean-type ecosystems, with particular emphasis on the adaptive significance of level of serotiny in plants (e.g. see Enright et al. 1998a,b; Journal of Ecology 86: 946-959 and 960-973).

Oral presentation, Thursday, 4:15 PM, B112

Fire regime and phenology changes combine to threaten plant species persistence as climate warms

A continuous trend of warming and drying in Mediterranean-climate type regions globally is predicted to result in major species losses and shifts of vegetation structure and dominance in these biodiversity hotspots. Such assessment is largely based on projected climate change impacts alone and ignores possibly deleterious interactions with other factors such as fire regime. Fire is arguably the dominant landscape scale disturbance factor in terrestrial ecosystems globally, and recent studies using a range of GCMs project a more fire-prone future for many parts of the world, especially in the middle and high latitudes. We argue that three inter-related plant species demographic impact factors associated with climate change, fire regime change, and the climate – fire interaction, have the potential to drive species losses and system state changes more quickly than is predicted from climate or fire regime change alone. We describe these impact factors, present a conceptual model that predicts the direction and strength of impacts in regions characterised by different projected global environmental change futures, and illustrate them for example species and regions. These predictions provide a potential framework for understanding change impacts, and for adaptive management in relation to them.

Esque, Todd

Dr. Todd C. Esque has worked in the Sonoran and Mojave deserts since 1979. He currently works as a Research Ecologist with the US Geological Survey, Western Ecological Research Center in Henderson, Nevada. His research focuses on Disturbance Ecology with emphasis on community dynamics and responses of long-lived desert organisms. Dr. Esque's collaborative work on Mojave desert tortoise and Mohave ground squirrel habitat suitability modeling is widely used for conservation planning by resource management agencies.

Oral presentation, Wednesday, 11:00 AM, B115

Response of the Mojave Desert Tortoise to Post-fire Changes in Habitat

Wildlife responses to burned desert habitat are largely unknown. Wildfires burned more than 36,000 acres of critical habitat for the desert tortoise (Gopherus agassizii) in southern Nevada in 2005 and additional acreage in 2006. Direct effects of fire on desert tortoises include mortality due to acute heat exposure and loss of food and cover. Indirect effects include long-term changes in vegetation composition and structure, and these are hypothesized to affect the quality of desert tortoise habitat. Because of the Threatened status of the tortoise, resource managers wanted to understand the indirect effects of wildfire on tortoises. We compared behavior, reproduction, and survival for desert tortoises located in and adjacent to burned habitat. Annual plant production in burned habitat was higher than in adjacent unburned habitats and primarily consisted of invasive annual grasses. Burned habitat had lower perennial plant cover throughout the study. Despite these vegetation changes, observations across years indicated that tortoises moved further into burned habitat with each successive year following the fire. Foraging behavior was most often observed in burned habitat and "resting" was the most frequent behavior observed in unburned habitat. Tortoises were more likely to use burrows for shelter in burned habitat, while vegetation was used as a shade resource more often in unburned areas. Survival and reproduction were the same for tortoises regardless of the amount of burned habitat within their home ranges. This study illustrates that tortoises will re-colonize a one-time burned area in a short period of time following wildfire. However, the effects of repeated fires that further reduce the quality of tortoise habitat are currently unknown. The boundaries between burned and unburned areas are very important for tortoise re-colonization and for natural vegetation recovery, and these areas should be managed for desert tortoise habitat.

Estes, Becky

Becky Estes continued her career with the USFS accepting the position as the Central Sierra Province Ecologist where she is based out of Placerville, CA and provides logistic support to the Tahoe, Eldorado and Stanislaus National Forests. Recently, she published a research paper in the International Journal of Wildland Fire discussing the seasonal fluctuations of fuel moisture in thinning treatments.

Oral presentation, Tuesday, 1:40 PM, B112

Effects of prescribed fire and season of burn on Cypripedium montanum habitat

Cypripedium montanum (mountain lady's slipper) is a rare plant that occupies a wide range throughout the Northwest, but is found in isolated populations. C. montanum is characterized by a shallow rhizome making it potentially vulnerable to high severity fire. As a result, management recommendations are usually to flag and avoid, including the use of prescribed fire. However, the presence of fire scarred trees in close proximity to C. montanum plants suggests that populations were once resilient to fire. In order to determine the effect of fire on the plants, prescribed burning treatments were conducted in plots ($\approx$78.5 m²) in June 2010 (spring) and September 2010 (fall). Pre and post fire and fuel characteristics were observed. Temperature and residence time were measured using thermocouples at the surface, 2.5, 5 and 10cm from the top of the forest floor. Fuel loading and duff consumption were greater in the spring burns, although more large diameter fuels were consumed in the fall burns due in part to lower fuel moisture. No peak differences in temperature were noted at the surface, but residence time that exceeded 60°C (threshold for cellular death) was greater in the spring burns. Maximum temperature was higher and residence longer in the forest floor during the spring burns which correlated with lower duff moisture content. No differences in the heat pulse into the soil at either 5 or 10cm were noted as soil moisture was nearly equivalent. There is some preliminary evidence that two years post-burn the number of stems per plant in the spring burns were largely unaffected, while those in the fall burns were initially reduced by 50% but rebounded quickly the following growing season. Effects on the number of flowers and fruits on C. montanum plants were not as clearly defined in either the spring or fall prescribed burns.

Ex, Seth

Seth Ex is a Graduate Research Assistant in the Department of Forest and Rangeland Stewardship at Colorado State University. His PhD work is expected to improve forest inventory-based estimates of canopy fuel characteristics for western US conifer forests.

Oral presentation, Tuesday, 11:00 AM, B117

Crown fuel profiles from forest inventory data: Using stand density and species' shade tolerance to improve crown fire behavior prediction for western US conifer forests

Fuel mass in conifer crowns can be estimated from forest inventory data using simple, empirically-derived allometric relationships. While existing crown fuel allometries yield good biomass estimates, they generally make the unrealistic assumption that fuel is distributed evenly throughout the vertical crown profile, which has implications for crown fire behavior prediction. Estimates of canopy base height and bulk density, critical factors in crown fire behavior prediction, are derived by averaging individual tree crown fuel profiles across a stand of trees. Canopy base height is an important control on how readily fire transitions from the forest floor to tree crowns (torching), and canopy bulk density influences how readily fire is transferred between crowns in a canopy (crowning). If the assumption of even vertical fuel distribution is incorrect, estimates of canopy base height and bulk density will also be incorrect. Work in ponderosa pine stands has shown fuel is not distributed evenly throughout the vertical crown profile, but that mass is concentrated near the midpoint of crowns. Furthermore, vertical crown fuel distribution changes predictably with stand density. Fuel mass is concentrated nearer the top of crowns in crowded stands than in open stands. This relationship is consistent with 'self-pruning', a fundamental concept from forest stand dynamics: Tree crowns respond to crowding by shedding lower branches and concentrating foliage in favorable light environments. In this work, we describe the relationship between vertical crown fuel distribution and stand density for shade tolerant Douglas-fir, and compare our results with findings from earlier work on shade intolerant ponderosa pine. Our ultimate objective is to develop a suite of predictive models that use stand density and species' shade tolerance to estimate vertical crown fuel distribution for a number of important western US conifer species, thus improving forest inventory-based estimates of canopy base height and bulk density.

Falk, Donald

Don Falk's research focuses on fire history, fire ecology, and restoration ecology in a changing world. Falk is a AAAS Fellow and has been awarded a Fulbright Short-Term Scholar award, the Ecological Society of America's Deevey Award for outstanding graduate work in paleoecology, and an NSF Dissertation Improvement Grant. Don was co-founder and Executive Director of the Center for Plant Conservation, originally at Arnold Arboretum of Harvard University and now at Missouri Botanical Garden; he subsequently served as the first Executive Director of the Society for Ecological Restoration International (SERI). His books include Foundations of Restoration Ecology (Island Press, with M. Palmer and J. Zedler), and The Landscape Ecology of Fire (Springer; D. McKenzie, C. Miller, and D. Falk, Eds.).

Oral presentation, Tuesday, 11:25 AM, B112

A new North American fire scar network for reconstructing historical pyrogeography, 1600-1900 AD.

The Fire and Climate Synthesis (FACS) project is a collaborative effort to compile and synthesize fire and climate data for western North America. We have compiled over 900 multi-century fire-scar based fire histories from more than 50 data contributors in the western United States, Canada, and Mexico. Our emphasis is on understanding the role of long-term (annual to decadal) climate variation in regulating fire occurrence over the past 500+ years, complementing short-term fire season and weather outlooks. FACS is now the largest tree-ring based fire history network in the world, consisting of annually crossdated fire records covering more than 3,000 years (1248 BC – 2011 AD) and representing more than 15,000 site-year records. State space analysis indicates that the fire history network represents the full range of annual temperature and precipitation conditions in seven widespread forest types in western North America. A time series of number of sites with evidence of fire indicates repeated occurrence of widespread non-lethal (low- and moderate-severity) fire; fires were recorded at more than 200 sites three times (1748, 1829, and 1851) in the past 400 yr. When corrected for sample size, fire was recorded at ≥ 20 % of sites in 13 years, including 5-6 times per 100 yr in the 18th and 19th centuries. Spatial analysis of large-scale fire occurrence patterns indicates years in which teleconnections of the El Niño-Southern Oscillation (ENSO) regulate regionally synchronized high (low) fire occurrence years through expression of regional drought (wet) conditions, following a north-south dipole. In other years fire conditions are coherent along an east-west pattern, or are widespread across western North America reflecting the influence of other long-term climate oscillatory modes. This long-term, large-scale reconstruction of fire patterns will inform understanding of the role of climate in both historical and contemporary fire regimes.

Falk, Donald

(See biographical information, above.)

Oral presentation, Wednesday, 2:30 PM, B112

Understanding climate drivers of past regional-fire years across scales in central Oregon.

Documenting historical fire regimes provides an unparalleled view of ecosystem function over extended scales of time (years to centuries) and space (sites to regions). Crossdated tree-ring records of tree growth and fire occurrence can be determined accurately to the year, making such records a valuable tool for understanding how climate regulates fire regimes. We analyzed fire-scars from 19 sites in central Oregon (12 new collections and 7 existing records), including 10 multi-scale gridded sites and 9 non-gridded sites. Sample sites were primarily from ponderosa pine and dry mixed conifer community types. Fire chronologies indicate 22 years in the 340-yr period 1560-1900 with more than 10 sites recording fire, representing the occurrence of regionally widespread low- and moderate-severity fire years on average every 16 years. We correlated fire occurrence with reconstructed summer Palmer Drought Severity Index (PSDSI), temperature (1740-1900), precipitation, and indices of large-scale climate patterns (Pacific North American pattern and El Niño-Southern Oscillation). Climate conditions were analyzed for the full set of years, and separately for widespread (> 6 sites with fire, equivalent to the 96th percentile), local (1 to 5 sites with fire), and non-fire years. The number of sites recording fire was strongly negatively correlated with PDSI, reflecting a dominant drought signal in the fire year. Spring and summer temperatures were higher than average in fire years for the period of record. PNA and Niño-3 did not explain a significant proportion of variance in number of sites with fire. Regional fire years occurred almost exclusively in years of negative PDSI and above-average spring-summer temperature, whereas local and non-fire years were not different from mean drought and temperature for the period of record. These results indicate a strong predictive relationship of seasonal climate conditions to the spatial extent of regional fire years and their frequency of occurrence.

Falk, Donald

(See biographical information, above.)

Oral presentation, Tuesday, 2:30 PM, B114

How do rapid ecosystem shifts triggered by interactions of severe landscape disturbance and climate change our thinking about ecological restoration?

Wilderness areas offer unparalleled opportunities for learning how ecosystems respond to disturbance regimes and variability in climate. As climate changes and disturbance regimes amplify, even these 'natural' laboratories are likely to experience dramatic changes in species distributions and ecosystem functions. Modeling and empirical studies suggest that

changes due to climate alone are likely to be expressed at multi-annual to decadal time scales. In contrast, severe large-scale disturbances can reorganize ecosystems on much shorter time scales of days to months. Recent evidence from fires in the western US suggest that it is the combination of climate change and severe disturbance that is most likely to trigger abrupt ecosystem transitions into novel configurations, rather than either factor acting separately. These new configurations can be resilient in their new state, and resistant to return to pre-disturbance conditions. Such abrupt transitions are predicted to become more common under conditions of altered future climate and amplified disturbance regimes. We are studying the impacts of multiple successive fires and post-fire succession over a 35 year period in the Jemez Mountains in northern New Mexico, USA, one of the best monitored and instrumented ecosystems in western North America. The 63,400-ha 2011 Las Conchas Fire in New Mexico burned into the perimeters of several prior major fire events from 1977, 1996, and 2000, leaving large areas of landscape with nearly total tree mortality. In areas of repeated burns, particularly at high severity, we predict the most rapid triggering of ecosystem tipping-point behavior. Preliminary observations indicate large-scale type conversions, specifically from forested to forest-shrub and interior chaparral vegetation types following multiple severe fires with overlapping perimeters during a period of extended drought conditions. Large-scale and possibly irreversible type conversions have potentially important implications for future restoration and management of ecosystems.

Ferrarese, Jena

Jena Ferrarese is a Graduate Research Assistant with the National Center for Landscape Fire Analysis in the College of Forestry and Conservation at the University of Montana where she explores the use of remote sensing technologies for fuels analysis. Among other roles, she is currently the Secretary at the national level for the Student Association for Fire Ecology.

Oral presentation, Tuesday, 2:05 PM, C122

Characterizing the heterogeneity of within-crown fine-fuel distribution for fire behavior simulation

The recent development of physics-based numerical wildland fire simulation models is focusing attention on ways to improve characterization of fine-grained fuel properties in three-dimensions. At tree scale, current studies usually distribute crown biomass uniformly through simple volumes described by cones and frustums. However, biomass is actually heterogeneous at a variety of scales from needle groups to clusters of trees. In this paper, we describe a novel technique using terrestrial laser scanning data to characterize within-crown fine fuel heterogeneity. The technique exploits the capacity of laser scanning for making many precise measurements, which are used to identify the occupied crown space. Using scan data from Douglas-fir trees from across the northern Rocky Mountains, USA, we threshold intensity values to select laser returns associated with fine fuels. We then utilize the native locations of those returns as inputs to three-dimensional point pattern analysis algorithms to describe the clustering of fine biomass. We contrast results with both uniform and random distributions, and consider the implications for crown bulk density calculations. This study is one component of a larger effort to develop universal models that realistically distribute fuel mass within tree crowns for common conifer species in the northern Rocky Mountains, USA.

Finch, Deborah

Deborah Finch received her Bachelor's Degree in Wildlife Management from Humboldt State University, Arcata, CA, her Master's in Zoology and Physiology from Arizona State University, Phoenix, and her Ph.D. in Zoology and Range Science from University of Wyoming, Laramie. Deborah was a research wildlife biologist employed by the USDA Forest Service, Rocky Mountain Research Station from 1978 to 2010, and is now a science program manager. Her research interests include ecosystem restoration using prescribed fire and fuel removal, ecosystem ecology, climate change, avian reproductive ecology and habitat relationships, invasive plants, at-risk species; and technology transfer. She supervises and coordinates a team of scientists who conduct research on restoration methods, fire ecology, invasive species, wildlife ecology and climate change.

Oral presentation, Thursday, 11:00 AM, B115

Effects of fuel reduction on wildlife populations in New Mexico

Fuel reduction involves removal or modification of vegetation and downed wood and is used to reduce the likelihood of ignition, to reduce potential fire intensity and spread rates, to lessen potential damage and resistance to control, or to limit the spread and proliferation of invasive species and diseases. How fuel reduction influences the distribution and reproduction of wildlife species is not well-understood, particularly in aridland ecosystems where drought or climate change in combination with other stressors is an increasingly prevalent force in shaping ecosystems. To understand wildlife response to fuel treatments, we first need to consider current conditions. In New Mexico, conditions have been greatly altered by

stressors such as fire, invasive species, fire suppression, logging and grazing. We report on results of fuel removal studies in a range of New Mexican ecosystems. In riparian woodlands of the Middle Rio Grande, we found that black-chinned hummingbird and mourning dove showed declines in recruitment after removal of invasive tamarisk and Russian olive, whereas other birds such as cavity-nesters and canopy-nesters showed no negative effect of treatment. In ponderosa pine forests, we found species specific response of birds and small mammals to fuel treatments. In a study on the Santa Fe National Forest in New Mexico, 10 of 24 bird species responded positively to forest thinning. Small mammals showed a positive response or a relatively neutral response to fuel treatments in New Mexico. The positive response in deer mice appeared to be related to the interaction of snow persistence in a wet year with removal of forest canopy, which served to alter some aspect of survival or reproduction such as the availability of herbaceous plants. In addition to treatments, other factors such as life histories, habitat use, and weather variation help to explain variation in wildlife responses in fuel removal studies.

Finney, Mark

Mark Finney is a Research Forester with USDA Forest Service, Missoula Fire Sciences Laboratory in Missoula, MT. His research focuses on various aspects of fire behavior, including development of operational fire behavior software and conducting laboratory research into how fire spreads.

Oral presentation, Tuesday, 2:05 PM, C121

Basic fire science and its role in supporting wildfire risk assessment

For large wildfires, risk assessment must account for fire growth in complex arrangements of fuel and terrain and under varying weather. A simulation approach to estimating risk requires computing fire growth for a very large sample of ignition locations and weather sequences. Thus, underpinning these simulations are models of fire behavior, which all have well-known limitations. Although the contribution of error by fire behavior models alone compared to the representations of weather, fuels, historical fire records, and suppression effects is not quantifiable, new research efforts into the physics of fire spread is needed for someday improving the reliability of fire behavior modeling in risk simulation. A brief synopsis of new laboratory research is presented which suggests we are only beginning to really understand how fire spreads.

Fitzgerald, Stephen

Stephen A. Fitzgerald   Currently, Fitzgerald is the Area Extension Forester for the Oregon State University Extension Service in the central Oregon region. Fitzgerald conducts extensive educational programming in wildland fire, fuel reduction, and post-fire recovery. Much of his silvicultural research deals with forest restoration and improving forest health in dry-site forests of central and eastern Oregon. Fitzgerald currently holds the rank of Professor in the Department of Forest Engineering, Resources, and Management in the College of Forestry at Oregon State University.

Oral presentation, Wednesday, 1:15 PM, B118

An Uneven-aged Management Strategy to Restore Old-Growth Ponderosa Pine Forests

Forest restoration has become a priority on federal lands to counter declining forest health and to reduce the risk of stand replacement wildfire. The goal of most restoration treatments aims to return forest to some semblance of their historic range of variability (HRV), including old-growth structure. Old-growth ponderosa pine forests on ponderosa pine and dry mixed conifer plant associations in Oregon were multi-aged with an inversed J-shape diameter distribution typical of uneven-aged forests. These observations are based on historic surveys by forest examiners from the turn of the last century. Older forests also contained a myriad of openings of varying size affecting fire resistance, overstory and understory tree growth, understory plant diversity, and providing micro-habitats of early-seral conditions within old-growth stands. During the early 20th century much of the old-growth forests were harvested and, following harvest, regenerated on their own to form extensive stands of dense even-aged ponderosa pine forests. In this presentation, I report preliminary findings from a replicated study investigating the movement of dense even-aged ponderosa pine forests, which are abundant on the landscape (above HRV), to uneven multi-aged stands that resemble historic old-growth forest conditions. After an initial harvest in 2009 (e.g., conversion thinning), I simulated the growth and development of these stands using the Forest Vegetation Simulator to a target diameter distribution and stand density similar to historic old growth ponderosa pine forests first reported by early forest examiners. I demonstrate the time it takes to move contemporary even-aged ponderosa pine stands into an uneven-aged structure, describe what influence this management regime may have on carbon sequestration, and demonstrate the levels of forest products might be sustainably removed once the target stand structure is achieved. I also discuss the consequences of "diameter limits," which are often imposed on federal thinning and restoration treatments in Oregon.

Flint, Courtney

Courtney G Flint, Associate Professor, University of Illinois at Urbana-Champaign. Flint is a rural and natural resource sociologist who studies society-environment interactions. She studied community response to bark beetles and fire in Colorado and Alaska for ten years, shedding light on human heterogeneity in forest landscapes and implications for forest management. Other current work focuses on regional landscape conservation collaboration, water quality in agricultural and mountain ecosystems, stakeholder alignment and knowledge, and human-nature relationship influences on landscape engagement efforts.

Oral presentation, Tuesday, 4:40 PM, B115

Tracing Community Responses to Bark Beetles and Fire across Regions and Time

Study of forest disturbance by bark beetles in Alaska and Colorado highlight the influence of local cultural and environmental contexts on responses to forest change and risk. This paper reports core findings from 15 communities which experienced spruce bark beetle or mountain pine beetle disturbances, and in some cases fire, over the last ten years. Despite sharing similar disturbance experiences and forest risks, individuals and communities varied substantially in their perceptions and actions related to these changes. In Colorado, residents from higher amenity communities with lower tree mortality rates had lower risk perceptions and higher satisfaction with forest management than their counterparts in other communities. In Alaska communities, perceptions related to beetles changed over time, though concerns about fire remained high. We explore both the geographic and temporal dimensions of diverse community responses to forest disturbance and their resource management implications.

Flower, Aquila

Aquila Flower is a doctoral candidate in the Department of Geography at the University of Oregon. Her research focuses on using dendrochronology, statistical techniques, and geographic information systems to explore the influence of climatic variability and disturbances on forests in western North America. She has used statistical models to predict the future impact of climate change on forest health in British Columbia, and dendrochronological methods to reconstruct past climatic conditions and disturbance regimes over the last several centuries in British Columbia, Idaho, Montana, and Oregon.

Oral presentation, Thursday, 2:30 PM, B113

Wildfires and western spruce budworm outbreaks in the interior Pacific Northwest: a multi-century dendrochronological record.

The Douglas-fir forests of the interior Pacific Northwest are particularly susceptible to outbreaks of the western spruce budworm, a lepidopteran species that is widely considered to be the most damaging defoliator insect in the forests of western North America. In spite of the ecological and economic significance of this species, its outbreak patterns, population dynamics, and ecological impacts are still not fully understood. A frequently repeated hypothesis is that defoliators increase potential forest fire severity and/or probability of occurrence through the buildup of needles and wood killed during outbreaks. However, little is actually known about the complex relationships and feedback loops between defoliator outbreaks and wildfires. The historical observational record is unfortunately too short in much of western North America to provide us with a sound understanding of these ecological interactions. To address this knowledge gap, we employed dendrochronological methods to reconstruct multi-century records of wildfires and defoliator outbreaks at ten sites located along a transect running from northeastern Oregon to western Montana. We used time-series analysis techniques to assess inter-disturbance interactions and quantify the association between climatic variability and the occurrence of disturbances. Our results suggest that both wildfire occurrence and the initiation of western spruce budworm outbreaks are driven by moisture availability. A pattern of intra-disturbance synchroneity is apparent across the transect, with defoliation events evidently more synchronous than wildfires. Although both wildfires and western spruce budworm outbreak initiations were more likely to occur during droughts, the lagged relationship between the two disturbance types was highly variable. This suggests that if there is a causal relationship linking defoliation events and subsequent probability of wildfire occurrence or wildfire severity, its signal is too weak to be identified given the strong and pervasive influence of climatic variability on both disturbance types.

Fontaine, Joseph

Joe Fontaine, Lecturer, School of Environmental Science, Murdoch University, Perth, Western Australia.

Oral presentation, Tuesday, 2:30 PM, B112

Species persistence in fire-prone shrublands of Western Australia: effects of fire interval and climate

Disturbance frequency, such as the interval of time between successive fires, is widely recognised as an important driver of vegetation structure and composition. Of particular interest is the effect of shortened fire intervals and their interactive effects with changing climate to fundamentally change the plant communities and the relative abundance of differing life history strategies. Concern regarding short-interval fires (also known as reburns) is widespread but studies are often limited to a single example, especially in fire-prone systems with longer intervals. Using a series of experimental fires (N=33) over four years, we studied the effects of shortened fire intervals ranging in time from 3-24 years in high diversity Mediterranean shrublands of Western Australia. These shrublands possess fire intervals variously estimated at 13-17 years. Plots were measured immediately before and 2-3 yrs after fire where all species were identified and counted. Species were classified into two plant functional types based on fire-related traits of post-fire regeneration (sprouting vs. non-sprouting) and seed storage (canopy, soil). Pre to post changes in abundance for each plant functional type were analysed with respect to fire interval, winter rainfall, and geology (acid sands vs. calcareous sands). Fire interval was a strong predictor of post-fire changes in abundance with non-sprouting, canopy-stored seed species being the most sensitive to short-interval fires and resprouting, soil-smoke stored species being the least sensitive. Winter rainfall also influenced post-fire persistence with a strong interaction with fire interval. Neutral responses of most plant functional types (i.e. persistence through fire of species) were achieved by approximately 9-11 years following fire, depending on plant functional type and winter rainfall. Application of prescribed fire at shorter intervals is likely to result in reduction of certain plant functional types on the landscape.

Fornwalt, Paula

Paula Fornwalt has been a Research Ecologist with the US Forest Service's Rocky Mountain Research Station since 2010. Her research examines how natural and human disturbances impact plant populations and communities in Rocky Mountain forests.

Oral presentation, Thursday, 1:40 PM, C125

Ten years of overstory stand structure, surface fuel, and tree regeneration dynamics following the 2002 Hayman Fire

In 2002, the Hayman Fire – Colorado's largest recorded wildfire – burned 55,800 ha of forest dominated by ponderosa pine and Douglas-fir. Also burned in the Hayman Fire were 25 pre-existing plots that had been surveyed two to six years prior for overstory stand structure, tree regeneration, and live and dead surface fuel loading. We examined tree and fuel loading dynamics by remeasuring these plots annually from 2003 to 2007, and again in 2012, to yield a dataset with one year of pre-fire measurements and six years of postfire measurements (postfire years 1, 2, 3, 4, 5, and 10). Analyses are currently underway, and will center on addressing questions such as: (1) What are the impacts of the Hayman Fire on overstory stand structure, and how do these impacts vary across gradients of fire severity and time since fire? (2) How long do fire-created snags remain standing, and are fall rates dependent on tree (e.g., species, size) or site (e.g., aspect, fire severity) properties? (3) How are live and dead surface fuel loads impacted by fire severity and time since fire? (4) How does fire severity influence postfire tree seedling establishment and growth over time?

Fotheringham, CJ

CJ Fotheringham received PhD in Ecology and Evolutionary Biology at the University of California, Los Angeles. She has been involved in numerous desert ecology and fire ecology studies in the American Southwest and has also conducted research in desert and fire prone communities in South Africa. Much of her research has focused on evolutionary aspects of seed germination and the impact of altered fire regimes and other human mediated impacts on fire-prone shrublands.

Oral presentation, Thursday, 3:25 PM, B118

The role of urban fuels in structure loss.

The relatively new focus of fire management in California on the Wildland-Urban Interface (WUI) has a greater potential to decrease losses of property relative to the previous focus of mitigation on wildland landscapes. As part of the USGS MultiHazards Demonstration Project we conducted a study that focused primarily on the urban side of the wildland-urban interface (WUI) to determine factors contributing to structure loss. All fires studied were wind-driven fires with propagation by embers and fire-brands well ahead of the fire front. These type of fires have three immediately discernible traits; 1) a rapid and large amount structure loss 2) damage primarily on the windward side of neighborhoods adjacent to open space and 3) an apparent random pattern to structure loss at a local scale. This is a post-hoc study of houses that were loss in large, wind-driven fires over the last decade throughout southern California. The study utilized historical oblique

aerial photos to assess ornamental vegetation characteristics, structural traits such as decks, patios and outbuildings, and location characteristics such as adjacent slope angle, distance to open space and primary road. Data were collected for both burned and unburned structures and statistically analyzed to assess risk factors. Findings indicate that location on the landscape and within neighborhoods, ornamental vegetation characteristics, accessory structures such as decks and outbuildings impact whether a structure will survive. Somewhat surprising was that fuel modification zone width showed no effect on structure survival and structure age was only important for interior placed homes.

Fowler, Cynthia

Cissy Fowler is an Assistant Professor at Wofford College, Secretary of the Society of Ethnobiology, and co-Editor of Ethnobiology Letters. Cissy conducts transdisciplinary research on society and nature. In her fieldwork in Eastern Indonesia's dry monsoonal tropics, she studies the materialization of fire; that is, fire as a creative expression of social relations and ecological perceptions. Cissy also engages in participant observation with American mountain bikers who create meanings through their encounters with forests mediated by technologies. In the U.S. South, Cissy focuses on the critical study of fire science and the use of fire to manage landscapes. Cissy also serves as a Commissioner of the Foothills Fire Service Area.

Oral presentation, Tuesday, 3:25 PM, B118

Mapping the emergence of indigenous fire ecologies, sociality, and self

Indigenous fire ecologies are the ways native communities use fire to shape their natural surroundings and the systems of knowledge, economic strategies, political goals, aesthetic desires, and spiritual pursuits guiding them. In viable indigenous systems, fire flows along human routes and humans adjust their movements to fire's designs. The interlocking processes of social relationships and disturbance regimes that develop over long periods of time in specific settings are indigenous fire ecologies. Indigenous peoples who live in the homelands of their ancestors draw upon sophisticated knowledge and technical skills as they maneuver in relation to climate, weather, and biomass to affect the cycles of fire and other components of disturbance regimes. In indigenous fire ecologies, native communities echo the rhythms of birth, death, and regrowth characteristic of disturbance regimes. Disturbance regimes similarly reflect the contingencies, ambiguities, fragmentations, and continuities of social life. In this presentation, I use a relational framework to explore the properties of indigenous fire ecology, sociality, and identity that emerge through mapping.

Fox, James

James F Fox, Director, UNC Asheville's National Environmental Modeling and Analysis Center (NEMAC). His work utilizes a business process of moving from data to decisions, involving the use of visualizations and story-telling. Mr. Fox works on projects on a variety of scales with partners that include the USDA Forest Service, NOAA and the Mountain Resource Commission of North Carolina.

Oral presentation, Thursday, 3:25 PM, B117

Ideas to Actions – Moving from Modeling to Implementation

The National Cohesive Wildland Fire Management Strategy is a complex project that involves many scientists and decision makers. When involving multiple decision-makers representing a variety of interests, what process works best to maximize several objectives? A key factor that has yielded good results involves all parties sharing responsibility for success. The scientists and modelers must translate and deliver their products using visualizations, graphics and "mind maps" to illustrate the complex system. This involves distilling the key findings into meaningful messages. The decision-makers must stay actively involved in the process, providing feedback on the models and determining appropriate performance measures that can be tested and prioritized. The cooperative effort of scientists and decision-makers supports the movement from just an "interesting conversation" to an action driven process of implementation and application. This process has supported national decision making powered by regional strategy committees. The committee approach has insured that the right stakeholders are involved – those who are really making the decisions. The regional approach has also shown that the scale of the decision is critical. When addressing such a complex problem as wildfire, we have found that balancing between multiple goals is best handled on a regional scale. We have found that if an alternative maximizes one goal but minimizes the others, it is probably not the right solution. This comparison of working alternatives must first be done on a regional scale, and then integrated into a national plan. The cohesive fire strategy has provided a good case study of scientists cooperating with managers. There were many challenges and lessons learned. This paper will provide both a retrospective and forward view of this ongoing project as it nears completion.

Frederick, Stacey

Stacey Frederick is a second year M.S. student in the College of Forestry at Oregon State University. Her interests lie in the human interactions and components associated with natural resources issues. Previous and current research experience explore these human dimensions as they relate to wildland and prescribed fires with a special emphasis on issues of fire smoke.

Oral presentation, Wednesday, 1:15 PM, C126

Perceptions of smoke management: Survey results from communities near four national forests

Smoke and reduced air quality as a result of fires (including wildfire and prescribed) has emerged as a major concern for many community members across diverse geographic regions. To date, limited social research has been done specifically regarding the impacts of smoke. Potential negative impacts to health, recreation, aesthetics, and safety could translate into barriers for the use of prescribed fire as a management tool and a reduced relationship between management agencies and their publics. New solutions are being sought on how to best deal with this concern. This study is part of a larger project funded by the Joint Fire Science Program that examines tolerance for smoke and communication methods between managing agencies and their publics on an in-depth level. This presentation will describe findings from mail-back questionnaires sent to communities in the United States adjacent to four national forests: the Fremont-Winema National Forest (south-central Oregon), the Shasta-Trinity National Forest (northern California), the Kootenai National Forest (northwestern Montana), and the Francis-Marion National Forest (central coast South Carolina). Survey findings discussed will include public perceptions of smoke and prescribed fire, potential influences on smoke tolerance, and communication/outreach strategies on these topics.

French, Nancy

Dr. French has been working on applications of remote sensing to ecology and vegetation studies for over 20 years. Dr. French's primary interests are in the study of forest ecosystems and the application of remote sensing and geospatial analysis techniques to ecosystem studies. Her research has focused on wildfires and their effect on the structure and function of the forest ecosystem and the implications of fire to carbon cycling. In particular, Dr. French is developing approaches to use satellite data to monitor the spatial and temporal patterns of fire and fire emissions with integrated remote sensing and GIS tools and models. Among other projects, Dr. French is leading a project investigating the implications of increased fire in tundra regions of North America. Dr. French serves on the Editorial Board and as an Assistant Editor for the International Journal of Wildland Fire. She is a member of the North American Carbon Program Science Steering Group. She has authored or co-authored 23 journal articles and more than 10 book chapters.

Oral presentation, Tuesday, 11:00 AM, C125

Remote Sensing of fire severity for estimating pyrogenic carbon emissions in High Northern Latitudes

Observed warming in the high northern latitudes (HNL) has implications related to increased fire in both boreal forest systems and tundra. Warming and modifications to climate patterns has led to more extensive and severe fire across the North American boreal region and an increase in fire occurrence in the tundra, a biome not known for broad-scale fire. Our ability to effectively monitor ecosystem change and carbon cycling in the HNL depends upon developing robust and reliable methods of extracting information about fire events and their impact from remotely-sensed data. Assessing fire severity is important when quantifying the loss of carbon, especially in northern systems where large amounts of long-held carbon are found in surface organic material. Results using Landsat for mapping severity in boreal regions has been mixed; some studies show Normalized Burn Ratio (NBR) methods to be of value, while other studies find the method to be unreliable across complex boreal landscapes. We review these results and how remote sensing has been of value for estimating carbon emissions in boreal systems of Alaska. We also present results of an analysis of temporal trends in spectral signatures of burned and unburned areas of tussock tundra obtained from Landsat imagery at the Noatak National Preserve in Alaska. The analysis showed the spectral signature of burned areas in tundra deteriorates rapidly. Our results showed that common mapping methods based on the NBR were inferior to other spectral indices and single Landsat bands in separating burned and unburned areas and mapping burn severity.

Friggens, Megan

Megan Friggens is a post-doctoral Research Ecologist with the Rocky Mountain Research Station where she studies the effect of climate change and other disturbances, including disease, on wildlife and wildlife habitats. Her PhD research examined the relationship between human disturbance and the spread of flea-borne diseases and she has also studied the influence of fire on small mammal parasite assemblages.

Oral presentation, Wednesday, 2:05 PM, B115

The interaction of fire and the spread of invasive pathogens and pests at multiple scales

Invasive species have huge economic and ecological costs for natural resources in the U.S. Historic and ongoing disturbance regimes, landscape structure, and human activities influence the potential susceptibility of natural systems and species to invasive pathogens and pests. Wildfires and fire management activities in particular may lead to increased or decreased spread of invasive pathogens and diseases in exposed species, habitats and landscapes. Mechanisms of spread and colonization vary for different pathogens. Fire and fire management activities can affect native species vulnerability and recovery, may intensify outbreaks within a population, or may prevent invasion altogether by disrupting dispersal corridors or access to susceptible species. Invasive species themselves may influence fire frequency and other ecosystem processes in such a way that favor further invasions by the same or other species. In this presentation, I review recent and ongoing research that examines the interaction of fire and invasive pathogen and pest species including the gypsy moth, fire ants, sudden oak death, and white pine blister rust. I also discuss potential fire impacts for invasive wildlife diseases through changes host resistance and population dynamics. Common forest management practices, such as thinning, fire suppression, prescribed fires, revegetation after disturbance, as well as natural disturbance regimes should be carefully considered for their potential to mitigate the impact of or slow the spread of invasive pathogens and disease.

Fry, Danny

Danny Fry, Research Assistant, UC Berkeley Danny completed his Master's of Science at Cal Poly in San Luis Obispo. He is currently employed as a researcher in the Stephens Lab at UC Berkeley. For the past 10 years he has been investigating changes in vegetation patterns, composition, and structure that result from both wildfire and prescribed fire. Topics of focus include fire modeling, the historical role and effects of fire in conifer forests, and prescribed fire effects on invasive species.

Oral presentation, Tuesday, 1:40 PM, C120

Patches and gaps: structural patterns of old-growth Jeffrey pine-mixed conifer forests with and without fire exclusion

Stem maps from four old-growth Jeffrey pine-mixed conifer forests were utilized to explore the variability in structural patterns (clusters of trees, solitary trees, and canopy gaps), characteristics recognized as important components of resilient forests. Two sites, both in the Sierra Nevada, represent fire excluded forests and were compared to two sites in northwestern Mexico, which have relatively intact fire regimes. In addition to fire regimes, the sites differ in soil type, annual precipitation, and productivity.   To describe structural patterns a patch detection procedure were used to identify clusters of trees with an intertree distance threshold based on individual tree crowns; two or more trees with overlapping crowns constitute a patch. For gaps, the PatchMorph tool in ArcGIS was employed to delineate forest openings in each 4 ha stem map.   The percentage of area in patches was higher for the Sierra Nevada sites (41-46%) compared to the Mexico sites (28-30%). The majority of trees (84-93 %) were members of patches, with average densities ranging from 6 to 11 trees per patch. Similarly, single trees were smaller in the Sierra Nevada sites (average diameter 16-26 cm) compared to the Mexico sites (29-34 cm). For all sites, less than 20% of the area was in gaps and there were no differences in average gap size, ranging from 341 to 422 m2.   Differences in forest structures can be attributed primarily to tree regeneration in the fire-suppressed forest sites, resulting in larger and a greater area in patches, although there were large variation at all sites. Restoring fire-frequent pine and mixed conifer forests in the western US requires treatments that will introduce or retain spatial variation of these structural patterns. One challenge is to utilize new or improve on existing methods to describe these characteristics in ways that are useful to forest managers.

Fulé, Peter

Peter Fulé is a professor in the School of Forestry, Northern Arizona University. He has worked in the U.S., Europe, and Latin America on fire ecology and fire-climate research.

Plenary talk, Wednesday, 9:50 AM, Ballroom

Systematic reviews: "studies of studies" to integrate scientific information

Given the overwhelming quantity of scientific research, many managers and scientists do not have enough time and often lack the specialized expertise to critically evaluate new science. As a result, much research can be "wasted" if managers keep using outdated techniques, frustrating funding agencies and missing opportunities to improve resource conditions. The technique of systematic reviews was developed from a medical science background and has been applied to natural

resource science. Methods for systematic reviews and examples from recent conservation literature are helpful for illustrating the strengths of this approach. Meta-analysis, a statistical technique, can enhance the value of systematic reviews for consolidating data from multiple studies for a quantitative comparison. Both systematic reviews and meta-analysis are practical tools for integrating science.

Ganteaume, Anne

Dr Anne GANTEAUME is a Researcher at Irstea (National Research Institute of Science and Technology for Environment and Agriculture) in Aix-en-Provence (SE France). She works in the Research Unit "Mediterranean Ecosystems and Risks", specifically on forest fires. PhD in Ecology, she is involved in several European research projects, sometimes as Team Leader. Her topics are the fuel characterization, fuel flammability and combustibility as well as fire ecology and fire causes in the framework of the fire risk assessment.

Oral presentation, Thursday, 1:40 PM, B113

Comparison of flammability of litters sampled according to two different methods

In laboratory conditions, reconstructed or intact litter samples can be used to assess the flammability of dead surface fuels but the sampling method could affect litter flammability results. To assess this effect, samples of litters were collected in south-eastern France, according to two different methods previously used in other studies, one keeping intact the structure of litter layers (intact litter) and the other using mainly the surface litter layer to reconstruct the litter sample (reconstructed litter). The sampling occurred in representative ecosystems of the study area: pure Pinus halepensis stands, mixed pine-oak stands, pure cork oak stands and in two types of shrubland (maquis and garrigue). Flammability experiments were carried out on fire bench, using a glowing firebrand as ignition source and a 10 kmh-1 wind. The main variables recorded were: ignition frequency, time-to-ignition, flaming duration, flame rate of spread, flame propagation, mean flame temperature, maximum flame height and rate of consumption. The comparison of flammability results showed that the sampling method had a significant effect on litter bulk-density, rate of spread and rate of consumption, intact litter being more flammable than reconstructed litter. The type of vegetation had a significant effect on litter depth, ignitability and combustibility (except on flame temperature and rate of spread) and the litter composition could explain in part this fire behaviour. The effect of the reconstruction of litters on flammability parameters and its magnitude differed according to vegetation types. The intact structure of the litter appeared to be an important driver of its flammability, especially for combustibility and consumability. The assessment of these parameters will differ when using reconstructed litter samples compared to intact litter samples. Future research on litter flammability should take into account the bias due to the litter sampling method when the litter is reconstructed.

Ganteaume, Anne

(See biographical information, above.)

Oral presentation, Thursday, 2:05 PM, B113

Spatial and temporal variation of fire in south-eastern France

SE France is the area the most affected by wildfires, so for a better fire prevention, it is necessary to understand the variation in space and time of wildfires and to improve the knowledge of their causes. Using the forest fires database Prométhée which gathers all the forest fires of SE France since 1973, the number of fires, their size and causes were investigated during two time periods (1973-1990 and 1991-2010), in three geographical areas of the study area. Two fire sizes were taken into account as the large fires (≥100 ha) represented 1% of the total number of fires but burned 72% of the total area between 1973 and 2010. There was a significant decrease in occurrence and burned area from the first period to the second, except for region 1 in which the number of fires increased. The three regions differed significantly in number of fires and burned areas, region 1 being the most affected. The knowledge of fire causes varied spatially; the proportion of unknown causes being the highest in region 1, and it increased between both periods. Fire causes varied spatially; the main causes were arson in region 1 and negligence during professional activities (especially farm works) in regions 2 and 3. There was also a temporal variation, following the LCLU changes, but also between the seasons. On the whole, the proportions of causes due to arson and to negligence during leisure activities increased between both periods, especially in summer, while that of causes due to professional activities, more frequent from fall to spring, decreased regardless of the region. Large fires were mainly due to arson, except in region 3 where negligence during farm works was the main cause, whereas smaller fires were mainly due to negligence during farm works especially. Before 1991, the main cause differed between regions, ranging from negligence during professional activities (region 3) to arson (region2) and accidental fires in rubbish dump (region 1) but since then, arson is the most frequent cause regardless of the region.

Gdula, Eric

Eric Gdula, Fire GIS Specialist, Grand Canyon National Park. I have worked at Grand Canyon for the past 12 years. Previous work includes being the GIS Coordinator for the Southeast Utah group of parks (Arches, Canyonlands, and Natural Bridges), as well as being the GIS specialist at Isle Royale National Park. A portion of my work includes burn severity mapping. I've developed some techniques at Grand Canyon that have lead to customizing the Monitoring Trends in Burn Severity data which result in very accurate maps.

Oral presentation, Thursday, 4:15 PM, B116

Innovative Uses of Monitoring Trends in Burn Severity (MTBS) data at Grand Canyon National Park.

Grand Canyon National Park has an active fire program. The current 10 year average annual fire activity is 11,200 acres per year. To date, the Monitoring Trends in Burn Severity (MTBS) program and Grand Canyon National Park staff have mapped burn severity for 50 fires, totaling over 116,000 acres. A critical part of the fire program has been using the MTBS data to assist with fire management decisions. The park uses this severity data in a number of interesting ways, including pre fire planning, at the inception of fires, during protracted events, and post fire analysis. Examples of each of these uses will be discussed during this talk.

Gibbons, Philip

Dr Philip Gibbons a Senior Lecturer at The Australian National University. He spent the first half of his career working with State Government agencies in Australia as a park ranger, fire fighter and forest ecologist. Since completing a PhD in 1999 he has played a key role in reforming Australia's native vegetation laws. He recently led a major research project on land management and house loss after Australia's devastating Black Saturday fires.

Oral presentation, Thursday, 2:05 PM, B118

What are the most effective fuel treatments for protecting houses during wildfires?

We measured fuels and land management around, and upwind, of 500 houses within the boundaries of three wildfires in south-eastern Australia. In a statistical model explaining house loss, fuels within 40m of houses were more important (63% of explained deviance) than fuels further from houses (13% of explained deviance). The most effective fuel treatments (in order of decreasing effect) were: (1) the cover of trees and shrubs within 40m of houses, (2) the type of vegetation within 40m of houses, (3) the upwind distance from houses to groups of trees or shrubs, (4) the upwind distance from houses to public forested land (irrespective of whether it was managed for nature conservation or logging), (5) the upwind distance from houses to prescribed burning within 5 years, and (6) the number of buildings or structures within 40m of houses. All fuel treatments were more effective if undertaken closer to houses. For example, 15% fewer houses were destroyed if prescribed burning occurred at the observed minimum distance from houses (0.5 km) rather than the observed mean distance from houses (8.5 km). Our results imply that a shift in emphasis from broad-scale fuel-reduction to intensive fuel treatments close to property will more effectively mitigate impacts from wildfires on peri-urban communities. We intend to repeat this study across wildfires from different continents to determine to what extent these results apply more broadly.

Gibson, Fiona

Dr Fiona Gibson, Research Assistant Professor, University of Western Australia Fiona completed a Bachelor of Science, with honours, at the University of Western Australia in 2004. Following this Fiona took an environmental planning position within WA's Department of Planning and worked to develop land use and water planning policies for WA. Fiona left the Department in 2008 to pursue a PhD, which she completed in 2011. Fiona is currently working in the space of bushfire management, biodiversity and water resources. Fiona's research aims to provide better advice to decision makers on effective policy design and the factors driving community adoption of such policies.

Oral presentation, Thursday, 4:40 PM, B118

Using participatory modelling in fire risk management: a case study in Central Otago, New Zealand

Land management and human behaviour can pose a fire risk to life and property assets. In Central Otago, New Zealand, farming practices, forestry operations and community behaviour are actions that can be targeted by public agencies to reduce fire risk to assets. A participatory modelling framework was designed to quantify the benefits and costs of various fire risk mitigation strategies intended to protect residential and commercial forest assets in Naseby, Central Otago. The model was developed in consultation with public agencies, scientists and private land managers. Using experience in environmental management we incorporate stakeholder adoption of strategies and socio-political risk of strategy failure in our mea-

sure of strategy cost-effectiveness. We present results for a range of strategies, exploring the value for money of strategies that deliver competing outcomes. It is shown that fire risk reduction strategies implemented further from the assets, such as government subsidisation or taxation in the agricultural region, have a low cost-effectiveness given the low instance of fires reaching the assets studied in the numerical application. In contrast, strategies closer to the assets, such as community education, provide a cost-effective means of reducing losses due to the relatively high incidence of fires in the residential area. The participatory modelling framework provides three key outcomes: information to public agencies and private land managers on the cost-effectiveness of fire risk mitigation strategies; collective understanding of the issues relevant to each interest group; and information to scientists and public agencies on the key research gaps for fire management in New Zealand.

Godwin, Daniel

Daniel Godwin, a graduate student in the Division of Biological Sciences at the University of Missouri, currently serves at the national president for the Student Association for Fire Ecology.

Oral presentation, Thursday, 1:15 PM, B114

Piping Hot: A Cheap(er) Way to Measure Fire Temperatures

Stand- and plot-level variation in fire behavior can be difficult to measure in the field, particularly across complex fuel beds. Maximum temperature and residence time are important parameters for quantifying fire behavior and predicting fire effects, yet current methods to measure these parameters can be impractical for many field applications. To address this need, this project tested a low-cost method of measuring fire temperature and residence time during a series of dormant season prescribed fires within biannually burned plots in the Experimental Burn Plots at Kruger National Park. Fuels within the plots were variable in structure and biomass but were similar in structure and load to FM02. Randomly established transects within each burn plot measured temperature data before, during, and after burning using iButton sensors placed within insulated pipes. Transects within each plot also assessed prefire fuel loads and post-fire first order fire effects. Within plot fire behavior was reconstructed post facto from spatio-temporal temperature distribution variability. Although similar work has been completed with thermocouples and temperature sensitive paints, preliminary results from this work suggest that this method provides a rugged yet more precise method of measuring important fire behavior variables.

Godwin, David

David R. Godwin Research Assistant School of Forest Resources and Conservation University of Florida   David was one of the first recipients of the Association for Fire Ecology and Joint Fire Science Program Graduate Innovation Awards (GRIN).

Oral presentation, Thursday, 4:15 PM, B111

The influence of prescribed fire and understory mechanical fuels mastication on soil CO2 efflux in Florida flatwoods forests

The need for understanding soil carbon dynamics in forested systems has increased in importance as global climate change discussions recognize the key roles forest soils play in global carbon cycles. The majority of carbon sequestered in most forested systems lies within the soils, with soil CO_2 efflux comprising a significant portion of total ecosystem carbon budgets. A variety of forest management activities, including prescribed fire and mechanical fuels treatments, have been shown to significantly influence soil CO_2 flux rates in the Western United States, yet these relationships are not well known in Southeastern US forests. Prescribed fire is one of the most prevalent forest management tools employed in the Southeastern US, and mechanical fuels mastication treatments are becoming more common in the region as efforts to mitigate potential wildfire behavior in the wildland urban interface grow. This study sought to understand the influence of prescribed fire and mechanical fuels mastication treatments on soil CO_2 efflux (Rs), soil temperature (Ts), and soil moisture content (Ms) in flatwoods forests, the most common natural forest type in Florida. The study took place within the United States Forest Service Osceola National Forest, Columbia County, Florida, USA approximately 20 km from the town of Lake City (30° 14'N, -082° 31'W). The study consisted of twelve soil carbon respiration plots representing three treatments: prescribed fire, mechanical fuel mastication, mechanical fuels mastication + prescribed fire, and a control. Data were assessed after sampling monthly for a period of one year following prescribed treatment. Results indicated that neither prescribed fire nor mechanical fuels mastication nor mastication followed by prescribed fire significantly altered Rs rates, Ts, or Ms relative to control. Results suggested that the effects of prescribed fire and mechanical fuel treatments on the drivers of Rs rates in this system are minimal within the period examined.

Goolsby, Reginald

Reginald Goolsby is a fire ecologist on the Francis Marion and Sumter National Forest in South Carolina. He received his B.A. in communications from Furman University and his Masters in Forestry Resources from Clemson University.

Oral presentation, Wednesday, 2:05 PM, B117

Providing science to managers: the Francis Marion and Sumter National forest prescribed fire prioritization model

As prescribe fire targets increase, so do the demands on fire management officers (FMOs) to prioritize treatment areas. Prescribed fires accomplish multiple objectives including reducing hazardous fuels, improving wildlife habitat, aiding listed species and increasing resource access. Researchers have provided guidance to help FMOs reintroduce fire into the landscape most appropriately; yet dialogue between scientists and managers is still not what it should be. FMOs need knowledge in a format understood by the "boots on the ground" rather than the scientific community. At the request of its FMOs, The Francis Marion and Sumter National Forest developed a fire prioritization model founded on fire science and understood by management to answer the questions of "when to burn, where to burn, how to burn, and why to burn." The burn prioritization model ranks treatment areas on ecological and logistical scores and allows users to set optimal burning constraints such as days since rain, KDBI, relative humidity, temperature, and season of burn to achieved desired resource goals. The goal of many burns is ecological restoration therefore some criteria such as percent of fire-dependent vegetation, departure from desired condition, and presence of listed species were factored in. Some logistical score criteria factored in were ignition patterns, fireline construction and holding, road closures, smoke management and personnel requirements. The model allows managers to enter day of burn environmental conditions which the model provides the user with the optimum location to burn to achieve desired management results. The advantages of this model over others is that it closes the gap that has divided researchers and science from the on the ground technicians actually managing the land. Researchers now have an interactive way to descriptively describe the best optimal way to achieve resource objectives in a format that easy to understand by the managers applying the tool.

Graham, Russell

Research Forester Dr. Russell T. Graham has over 37 years of research experience with the Rocky Mountain Research Station. Russ has published over 200 scholarly articles with his research focusing on long-term forest productivity and landscape processes. He has been involved with understanding and describing northern goshawk habitat throughout the Rocky Mountains and involved and led landscape level ecosystem projects throughout the central and western (e.g., Interior Columbia Basin Ecosystem Management Project) United States. He led the Hayman Fire (Colorado) Study Team, a national team synthesizing information for planning fuel treatments, a team reviewing the Cascade Complex of wildfires that occurred in central Idaho in 2007, and is presently leading a team reviewing the Colorado Fourmile Canyon Fire.

Oral presentation, Thursday, 11:00 AM, C125

The Colorado Fourmile Canyon Fire of 2010: behavior, suppression, efficacy of fuel treatments, and the damage it caused

The Fourmile Canyon Fire burned in the fall of 2010 in the Rocky Mountain Front Range adjacent to Boulder, CO. The fire occurred in steep, rugged, terrain, primarily on privately owned mixed ponderosa pine and Douglas-fir forests. The fire started on September 6 when the humidity of the air was very dry ($\approx < 7\%$) and the winds were steadily blowing in the range of 15 miles per hour and gusting to over 40 miles per hour. These conditions prevailed for most of the first day when the fire burned around 5,700 acres and destroyed 162 homes. Because of the windy conditions, aircraft could not be used until late that first day. The first responders concentrated on evacuating the occupants of the 474 homes in the fire vicinity. No public or firefighters were injured during the course of the fire. This outcome was directly related to the excellent preparedness of Boulder County and in particular the Sheriff's Department and the local fire districts. Fuel treatments had previously been applied to several areas within the fire perimeter to modify fire behavior and/or burn severity if a wildfire was to occur. However, the fuel treatments had minimal impact in affecting how the fire burned or the damage it caused. After the initial day of intense burning and four additional days of relatively benign fire behavior the Fourmile Canyon Fire had burned 6,181 acres and become one of the most damaging fires in Colorado's history. This report summarizes how the fire burned, the damage it caused, and offers insights to help the residents and first responders prepared for the next wildfire that will burn on the Colorado Front Range.

Gray, Miranda

A native of Albuquerque, New Mexico, I received my BA in mathematics from Macalester College in St.Paul, MN. After graduating I moved back to New Mexico and spent three years as the GIS director for the New Mexico Wilderness Alli-

ance. After time in the non-profit sector I decided to gain experience with a federal agency and worked for a year in the USFS Region 3 Lands and Minerals group. In this time I was drawn to the present day challenges and immediacy of wildland fire ecology and management. I decided to pursue a graduate degree in environmental science and policy with a focus on fire modeling, and am currently in my second year at Northern Arizona University.

Oral presentation, Tuesday, 4:15 PM, C126

Landscape-Scale Models and Maps of Fire Connectivity in the Sonoran Desert

In the Sonoran Desert of Arizona, heterogeneity in the amount and location of precipitation can result in extreme inter-annual fluctuations in fine fuel accumulations. Coupled with ongoing climate change and invasion by non-native grasses and forbs, this pattern has the potential to contribute to more frequent and larger fires that might have been historically uncommon. Where sparse vegetation and mild weather one year might regulate the frequency and spread of fire, contiguous beds of plant biomass and anomalous weather the next year can spread fire across large extents. Appropriate fire management in this region will require an improved understanding of the dominant drivers of fire under variable climatic and fuel conditions, as well as the implications of increased fire risk. As a step towards extending the scope of fire research and management in this region, our research focuses on predicting the relative contributions of fuel attributes (e.g., loading and configuration), topography, human infrastructure and climatic variables to fire risk. We are integrating remotely sensed fuels data and empirical fire occurrence data into an ecologically based connectivity framework that identifies thresholds of fire risk, and isolates areas and conditions that contribute most to these thresholds. This work builds on concepts and spatial models that are accessible to multiple land managers in the region.

Greaves, Heather

Heather Greaves is a graduate research assistant in the College of Forestry at Oregon State University.

Oral presentation, Wednesday, 2:30 PM, B118

Characterizing potential effects of climate change on fire and vegetation dynamics in a dry interior Northwest forest

In the Oregon East Cascades, any changes in vegetation and disturbance regimes due to climate warming will impact wildlife habitat, timber and water resources, and recreational opportunities on both public and private lands. However, the complicated interactions among physiology, phenology, and disturbance are difficult for researchers to quantify and synthesize, especially at the large spatial and temporal scales involved. I used FireBGCv2, a spatially explicit mechanistic forest succession and disturbance model, to simulate fire, vegetation, and landscape dynamics in a portion of the Deschutes National Forest under 18 potential climate change scenarios. In particular, I investigated how mean fire intensity and the proportion of high-severity burned area responded to potential climate and fire management, and how these fire dynamics interacted with fuel loads and vegetation. Simulation scenarios included all combinations of +0°C, +3°C, and +6°C of warming; +10%, ±0%, and -10% historical precipitation; and 10% and 90% fire suppression, and were run for 500 years. Changes in precipitation did not strongly affect fire or vegetation dynamics. Averaged over time, rising temperatures decreased mean fire intensity, as more-frequent fire reduced fuel loads sooner. However, because warming and frequent fire increased the prominence of shrubland and young forest, which are vulnerable to fire, the proportion of high-severity burned area increased with temperature. In scenarios with less fire suppression, this trend was amplified. Rising temperatures also reduced area occupied by cool-adapted forest types, while frequent fire broke apart large homogeneous forest stands and diversified the distribution of forest structural stages on the landscape. These simulations suggest that climate warming and increasing fire frequency may bring the landscape closer to its historical structure and configuration, but will likely alter its vegetation composition.

Greene, Gregory

Gregory Greene is a PhD student in Forest Sciences at UBC. He obtained a BSc in GIS in 2008 from Cal Poly Pomona, and earned a MSc in Geography from UBC in 2011. He has worked as a wildland firefighter for the US Fish & Wildlife Service, as a GIS analyst in the fields of archaeology, forestry and wildfire management, and has been studying fire ecology since 2009. His PhD research will examine the spatial and temporal aspects of historic fires in the Rocky Mountain Trench of BC, including mapping historic mixed-severity fires in GIS, recreating historic stand structure and fuel arrangements, assessing the rate and patterns of infilling of post-fire ponderosa pine and douglas-fir stands, and modeling fuel hazards.

Oral presentation, Thursday, 11:00 AM, B114

Mixed-Severity Fire Regimes in Montane Forests: The Darkwoods of British Columbia

We present strong evidence that mixed-severity fire regimes historically dominated in mountain forests of southeastern British Columbia (BC). We reconstructed fire history of the mixed-conifer, mountain forests of the Nature Conservancy of Canada's (NCC) "Darkwoods" property near Creston, BC. From a network of 40 study sites, we reconstructed the historic fire regime using tree-ring information obtained from 287 fire scar and stand age samples. Between 1700 and 1966, 35 fires burned; 10 were wide spread. Fire-scar analysis indicated variable site-level fire return intervals ranging from 3 - 128 years. Logistic regression confirmed elevation as the dominant spatial control on fire occurrence, with low-severity, stand-maintaining fires in the lower elevations (<800m), and high-severity, stand-replacing fires in the highest elevations (>1500m). We found abundant evidence of mixed-severity fires in the mid-elevations (800-1500m). Our results have important implications for fire and timber management, conservation and restoration decisions. For example, "Natural Disturbance Types" (NDTs) were developed in the 1990s based on expert knowledge of fire regimes and guide management strategies in BC. According to this system, all forests >800 m.a.s.l. in the Darkwoods are believed to be dominated by stand-replacing fires at intervals of 100 - 250 years. As a result, all wildfires are suppressed and even-aged forest management is promoted. Our findings indicate two errors in the representation of historic fire regimes in the current NDT system: (1) stand-replacing fires are over-represented in mid-elevations; (2) there is an under-representation of the range of intervals between successive lower-severity fires. This results in a systematic reduction of complex, uneven-aged forests and homogenization of the landscape, especially along the elevational gradient. We recommend existing policies and regulations be modified to recognize low- to moderate- severity fires in mid-elevation forests, including a new disturbance type with greater range of variation that better reflects mixed-severity fire regimes.

Gresswell, Robert

Bob Gresswell has been studying habitat relationships and life-history organization of cutthroat trout for more than 35 years. He is currently a research biologist with the US Geological Survey, Northern Rocky Mountain Science Center in Bozeman, Montana, and he is an affiliate assistant professor in the Department of Ecology at Montana State University. Bob became involved with research on the effects of fire while working in Yellowstone National Park, and his current research reflects a continued interest in the role of disturbance in shaping aquatic systems. He is the author of numerous papers concerning the effects of fire on aquatic systems.

Oral presentation, Thursday, 2:30 PM, B115

Predicting the Spatial Distribution and Potential Consequences of Postfire Debris Flows to Native Trout Populations in Headwater Streams

Many native salmonids have experience substantial reductions in available habitat, and current most populations are found in headwater stream systems. Headwater streams in the intermountain west are susceptible to disturbances such as postfire debris flow. Because the probability of debris flow increases in landscapes that have recently burned, identifying susceptible areas before the occurrence of wildfire may provide information necessary to protect remnant headwater populations. Predicting the timing, extent, and severity of wildfires and subsequent precipitation and runoff events is difficult; however, it is possible to identify channels in stream networks that are prone to debris flows. We conducted fine-scale spatial analyses of debris flow potential in 11 high-elevation stream networks of the Colorado Rocky Mountains. We identified at-risk channels using a model based data from geographic information systems (GIS) describing topographic characteristics, and assessed the potential for catastrophic population disturbance given an extreme fire event and severe postfire storm scenario. Results from the GIS model suggests that trout populations in many of the study watersheds occupy areas with a high probability of experiencing post-wildfire debris flows, but the extent of their distribution and location within the stream network provide sufficient refuge to prevent watershed-scale extirpation of trout. These models yield a decision making tool that is intended to provide qualitative assessment of debris flow potential in stream reaches within a basin context. The reach-scale model was designed for simplicity and flexibility; thus, it can be used to develop comprehensive management strategies for restoration, protection, and post-disturbance remediation of headwater stream networks that support remnant populations of native fishes.

Gross, Wendy

My name is Wendy S. Gross. As a graduate student at Penn State University, I am seeking a Master's of Geographic Information Systems degree. My research interests focus on the development of an interactive web-mapping tool to enhance the scientific exploration of historic fire-climate interactions and the mechanisms that drive them. In a complimentary capacity, I am employed as a Software Engineer/Data Manager for the NOAA National Climatic Data Center's Paleoclimatology Program.

Oral presentation, Tuesday, 1:15 PM, B113

LagMap: A Web-mapping Tool to Explore Historic Spatial and Temporal Drivers of Fire-Climate Relationships Using Superposed Epoch Analysis

Superposed Epoch Analysis (SEA) is a technique used to identify statistical relationships between climatic phenomena (e.g., drought), and environmental events (e.g., fire). SEA compares climatic time-series data with environmental events. The intent of the SEA is to determine if the climatic conditions, hypothesized to correspond temporally with events, are unusual or whether they represent normal climatic conditions.   LagMap is web-mapping tool that uses SEA to display time-lagged spatial variability in fire-climate interactions and the mechanisms that drive these interactions. Commonly, climatic data are spatially gridded and the data in each grid-cell are a time-series (e.g., Palmer Drought Severity Index data are stored as 2.5x2.5 degree grid-cells, each grid-cell representing a time-series). The results of a single SEA run are limited spatially to one grid-cell/time-series. However, this hinders the researcher's understanding of the spatial extent of the temporal patterns being analyzed. LagMap creates spatially explicit representations of SEA results over the full geographic extent of the gridded input data-set for all points in time (lags) prior to, during, and after the event. This permits researchers to identify the spatial extent of temporal fire-climate patterns and allows them to relate the spatial inference to the spatial footprint of key climatic mechanisms.   LagMap displays results of SEA as multiple interactive maps in the same browser window, each representing one time-lag. The user can customize display features of the interactive maps including: extents, reference map layers, color-palettes, and markers depicting sites of the Study Area. Display features are synchronized among all interactive maps. Additionally, LagMap generates publication quality maps, which inherit display customizations made to the interactive maps. Gridded data-sets that LagMap employs are Palmer Drought Severity indices reconstructed from tree-rings. Fire Event Years that researchers commonly use as input to LagMap are derived from fire scars in the annual growth rings of trees.

Gucker, Corey

Corey Gucker is an Ecologist Writer for the Fire Effects Information Systems (FEIS) at Missoula, Montana's Fire Sciences Laboratory. Corey graduated with an M.S. in Rangeland Ecology from the University of Idaho, where she studied the recovery of native and nonnative canyon grassland species following fire.   Corey synthesizes available literature regarding species' responses to fire for the FEIS website. Writing FEIS reviews involves locating, summarizing, and integrating information about the biology and fire ecology of plant species for land managers.   Corey nearly gave up on publishing her thesis work completed with Stephen Bunting, but finally in 2011, published her study and results in the Western North American Naturalist. Citation: Gucker, Corey L. and Bunting, S.C. 2011. Canyon grassland vegetation changes following fire in northern Idaho. Western North American Naturalist. 71(1): 97-105.

Oral presentation, Wednesday, 3:50 PM, B111

Gaps in information available to managers regarding fire and invasive plants

To manage fire without introducing or spreading invasive plants, wildland managers need information about the responses of invasive species to fire and conditions that increase site invasibility. Literature reviews and syntheses of original research are important sources of this information, but the usefulness of a review is limited by the quantity, quality, and geographic coverage of information available when it is written. We analyzed the information available for 61 literature reviews covering 74 plant species invasive in the eastern United States, which were published on the Fire Effects Information System website between 2008 and 2011. The study focused on the origin of information available in source documents, particularly whether or not it was based on actual observations. We found that observation-based information on fire and eastern invasive species was sparse, typically came from a small portion of the species' North American range, and had many other limitations. Nine of 61 reviews contained no observation-based information on fire at all. The metrics used to report invasive plant abundance after fire varied from study to study, making it difficult for reviewers to assess patterns. Furthermore, since very few sources reported abundance of an invasive species more than two years after fire, the relevance of the research to long-term fire effects and future land management strategies was questionable. Based on these findings, we offer suggestions to improve the reporting of original research, synthesis of available information, and application of information from syntheses to management.

Guyette, Richard

Richard Guyette, Professor, Department of Forestry. I have been involving and modeling human population density, culture, and ignitons into long-term fire history records for more than 30 years. I and others have authored many fire papers

with human demensions such as: Guyette, R.P. R.M. Muzika, and D.C. Dey. 2002. Dynamics of an anthropogenic fire regime. Ecosystems. 5(5): 472-486.

Oral presentation, Wednesday, 4:15 PM, B117

A quantitative method for estimating long-term influence of human ignitions on fire regimes

The purpose of developing an anthropogenic fire index is to detect changes in historic fire regimes due to human ignition. We developed the AnthroFire Index (AFI) using datasets of reconstructed drought and fire events. The index is based on two important assumptions: 1) that the absence of fires during drought years is due to a lack of ignitions (human and lightning) and, 2) that the occurrence of fires in wet years primarily results from human ignitions (accidental or purposeful). Assumption 1 relates to the potential abundance of ignitions when humans are present in an ecosystem under drought conditions. Assumption 2 relates to weather conditions (short-term drying of fuels) that permit fires to occur during 'wet' years, but not without abundant or intelligent ignition by humans. Drought years (PDSI < 0) with no fire were given scaled negative AFI values. Wet years (PDSI > 0) with fire were given scaled positive AFI values. These two annual values were scaled by the degree of drought and summed with a moving average. We used a 21-year moving average because it considers enough annual data to diminish short-term climate variation and it is long enough to provide estimates of fire-climate data that might be influenced by changes in human population, density, and culture. Examples of the AFI are discussed in ecosystems with known variability in population density, different climates, and different fuels.

Guyette, Richard

Dr. Richard Guyette, Professor of Forestry, University of Missouri. I have been involved in fire research in the eastern US for over 30 years, published many fire history papers including our most recent work: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.

Oral presentation, Tuesday, 1:40 PM, C122

Advancement in modeling the physical chemistry of climate and fire regimes

Recent developments of the Physical Chemistry Fire Frequency Model (PC2FM) are presented: Three new aspects are presented: a short introduction to the PC2FM, advances in using fire intervals as rates for climate-based fire probabilities, and using model residuals to examine non-climatic forcing in fire regimes. Model empirical data, chemistry, and calibration are reviewed. Two model components, the reaction environment and reactant concentration are discussed. Frequency estimates ($f = 1/t$) from time intervals (t) are developed by site and temperature scenarios and discussed with respect to ecosystem variability in North America. Model residuals are presented across ecosystems based on the absolute and percent deviation from the climate estimates of fire intervals. Non-climatic forcing factors of ecosystem fire regimes are discussed. Large residuals reflect deviations from climate influence caused by factors that include variable ignition rates from lightning and humans, topographic control of fire spread in heterogeneous and homogenous landscapes, and vegetation structure and fuel concentration.

Hagmann, Keala

Keala Hagmann is a Graduate Student at the University of Washington in the College of the Environment with Professor Jerry Franklin. She is working with timber inventory data collected between 1914-22 on the former Klamath Indian Reservation and 1922-25 on the Warm Springs Indian Reservation. This Bureau of Indian Affairs data provides a record of variation in historical forests based on a 10-20% sample of the forested area of these reservations from lower to upper timberline. These landscape-level reference conditions fill a gap in the information previously available to stakeholders and provide a record of historical forest conditions across 100,000s of hectares. Reference conditions can be used to guide management actions seeking to enhance the capacity of these dry forest systems to respond to current, projected, and unexpected stressors.

Oral presentation, Wednesday, 1:40 PM, B113

Landscape-level reference conditions and implications for ecological restoration in south-central Oregon

Remnants of dry forest systems that existed in the past operate now in a novel context of confounding and compounding stressors including increases in: human-generated fragmentation; loss of redundancy; pollution; connectivity for competitors and pathogens; and rapid, unpredictable climate change. Adding to the complexity of the current management and policy context is explicit recognition of a broad social range of variability – "the ecological condition acceptable to a society at a given time". In this context, reference conditions reflecting processes that shaped forests for millennia are consistent

with management objectives to reduce risk of loss given current, projected, and unexpected stressors. Spatially explicit, landscape-level timber inventories conducted early in the 20th century across hundreds of thousands of hectares provide detailed records of the coniferous forests in south-central Oregon. Using this record of conifers at least 15 cm in diameter at breast height (dbh), we describe variation in the historical structure and composition of ponderosa pine and mixed-conifer forests. Basal areas were overwhelmingly dominated by large diameter trees (>53.3 cm dbh) and by ponderosa pine. Tree densities were low relative to current conditions; mean values and ranges were greater on mixed conifer than on ponderosa pine sites. Ponderosa pine dominated species composition in the ponderosa pine forests and shared dominance in mixed-conifer forests. We infer from the predominantly low tree densities and dominance by large diameter trees across the moisture gradient represented by these three forest types (ponderosa pine and dry and moist mixed-conifer) that the disturbance regime (frequent wildfire) trumped productivity in structuring the historic forests in at least these areas.

Haire, Sandra

Sandra Haire is a member of the research faculty at the University of Massachusetts. She began her research on fire ecology in 2000, when Cerro Grande dominated the news. Since then her interests have focused on post-fire plant communities, including regenerating forests, in addition to broad-scale analysis of fire regimes on wilderness landscapes.

Oral presentation, Tuesday, 3:25 PM, B114

Defining habitats for surviving trees in wilderness following La Mesa fire 1977

A theory which has gained increasing attention in the face of anthropogenic climate change proposes that the formation of long-term refugia after severe disturbances affords protection to vulnerable species. Many wilderness areas offer unique properties that may lend themselves to formation and identification of refugia. Foremost, mountainous topography contains complexities that result in habitat diversity. Fragmentation defined by natural boundaries such as including rock, ice, and topographic variability creates relatively static properties which define heterogeneity important to system resiliency. To better understand how geophysical diversity fosters safe havens for biological legacies under changing disturbance regimes, we characterized habitats for islands of surviving trees after the La Mesa fire which burned in the Bandelier and Dome Wilderness areas in 1977. The islands were digitized from aerial photos taken approximately six years post-fire. Using a 10-m digital elevation model, we derived several terrain surfaces and compared the statistical distribution of values within islands to the distribution of values within high severity patches where all trees were killed. Based on a multivariate analysis, islands of surviving trees inhabited a different range of conditions than places where trees were killed in several respects. Landscape curvature indicated island habitats were more likely to exist in concave settings. Mean elevation and slope for surviving trees was lower than the mean for high severity patches. Survivors inhabited a narrower range of aspects and hillshades than did high-severity locations. Under the protection of wilderness, refugia habitats are more likely to be conserved. Potential habitats for refuges outside wilderness can also be identified and taken under consideration for future management.

Hallgren, Stephen

Stephen W. Hallgren, associate professor of forest ecology in the department of Natural Resource Ecology and Management at Oklahoma State University. His research focuses on effects of fire on forest ecosystems. He teaches forest ecology and wildland fire ecology and management. Dr. Hallgren administers the Fulbright US Student Program at OSU.

Oral presentation, Wednesday, 11:25 AM, C120

Consumption of oak forest litter by low intensity dormant season prescribed fire

Forests build up a relatively thick litter layer that is important for carbon sequestration, biogeochemical cycles, wildlife habitat and protection against soil erosion. The litter layer is also the fine fuel consumed by prescribed fires used in forests to manage fuel loads, reduce invasive species, maintain biological diversity and restore ecosytems to the historic structure and composition. We undertook a study to determine effects of long-term prescribed burning on the dynamics of litter in upland oak forests. Litter was measured in three wildlife management areas where prescribed burning had been practiced for at least 25 years. The fire frequency was 0–5 burns per decade and the time since last burn was 0–25 years. There were eight management units in each wildlife management area and 25–40 litter samples were collected in each unit in two consecutive years. We estimated the steady state litter standing crop was 11,300 kg ha-1 in forests with no prescribed fire, low intensity dormant season prescribed fire reduced the standing crop to 3,000 kg ha-1 immediately after the burn and the annual litter input was 5,400 kg ha-1. We estimated the percent of litter production removed by combustion by fire and consumption by microbial decomposition by modeling litter accumulation with and without prescribed fire. Only one fire

per decade was sufficient to consume 15% of litter production over the long-term and burning every year consumed 72% of litter production. Burning the forest every four years, a common practice in the region, consumed approximately 50% of litter production. Repeated burning over the long-term can have strong effects on forest litter and its ecosystem functions. These results pertain to warm climates with high rates of litter decomposition. In forests with slow decomposition prescribed fire could be expected to consume a greater percentage of litter production.

Halsey, Richard

Richard W. Halsey is the director of the California Chaparral Institute, a research and educational organization focusing on the ecology of California's chaparral ecosystems, the dynamics of wildland fire in both natural and human communities, and the promotion of nature education in a way that encourages communities to better connect with their surrounding, natural environment. Mr. Halsey taught biology for over twenty years in both public and private schools and was honored as the Teacher of the Year for San Diego City Schools in 1991. The second edition of his book, Fire, Chaparral, and Survival in Southern California, was published in 2008. Mr. Halsey was also trained as a Type II wildland firefighter with the U.S. Forest Service.

Oral presentation, Wednesday, 1:15 PM, C122

A Lesson in Fire, Science, and Politics: When the Understory Collides with Ideology

After the huge 1889 Santiago Canyon Fire in southern California, a regional San Diego newspaper exclaimed, "The menace should be removed by the removal of the brush. It is unsightly and dangerous." After the 2007 Witch Creek Fire, San Diego County's Department of Planning and Land Use developed a plan to remove "invading chaparral shrubs" from thousands of acres of wildland. In a letter to the California Department of Forestry, the county denied the occurrence of type-conversion in native shrublands due to high fire frequency and requested the state not consider climate change in developing future fire management plans. The reason given was that acknowledging these issues would interfere in the county's ability to obtain grants for fuel treatments. Due to misunderstandings about fire regimes, a bias favouring trees over shrubs, and the large influx of federal money to conduct vegetation management projects, politics present a difficult challenge when trying to develop science-based responses to wildfire. Within this charged environment, we attempted to work with local government to develop a comprehensive fire plan that would protect both human and natural communities. The effort ultimately ended up in court, with San Diego County being reprimanded by the judge for not following state law. The experiences and lessons learned during this process are applicable throughout the country.

Hamman, Sarah

Sarah Hamman is the Restoration Ecologist for the Center for Natural Lands Management. Her work is aimed at restoring rare species habitat in PNW prairies using rigorous science and careful conservation planning. Sarah received her Ph.D. in ecology from Colorado State University and most of her training and experience has been in ecosystem ecology, with a focus on fire effects on forest and grassland soils. She has also studied climate change impacts on Minnesota tallgrass prairies, wolf behavior and demographics in Yellowstone, fire effects on invasive species in Sequoia National Park, and restoration techniques for endangered species in central Florida rangelands. She also teaches Fire Science and Society and Restoration Ecology for the master's program at Evergreen State College.

Oral presentation, Wednesday, 3:25 PM, C120

Burning for butterflies: Can prescribed fire be used to restore habitat for fire-sensitive species?

Pacific Northwest prairies are one of the most endangered ecosystems in the United States. Over 92% of the original prairie habitat has been converted to agriculture, urban development, shrubland or forest, and only 1-3% is now considered to be in good condition. Prescribed fire is often the most effective and efficient tool to manage these systems, so managers have rapidly increased the use of prescribed burning across the region. In the past six years the number of prescribed burns conducted annually throughout Pacific Northwest prairies has doubled and the area burned has more than tripled, with strong interagency partnerships forming to share resources and collaboratively burn priority conservation areas. This progress, however, may be problematic for fire-sensitive species, such as butterflies. Several rare butterflies, including the Mardon skipper, Taylor's checkerspot and Puget blue butterflies exist on these prairies and restoration efforts are underway to enhance their populations. Managers trying to restore butterfly populations to fire-prone landscapes are faced with difficult decisions on where and how to burn to both sustain open grasslands and protect rare species. Our evaluation of fire intensity, severity and effects from three 2011 burns show that the burns are effective at increasing bare ground and removing invasive shrubs and grasses, but these species are often replaced by non-native forbs. Additionally, despite the fact that

some of the burns were conducted during hot and dry conditions, the intensity and severity of these burns were extremely spatially heterogeneous, leaving unburned and low severity patches throughout the units. The patchy exposed bare ground, reduced non-native grass cover and increased native richness may provide ideal conditions for recolonizing butterflies and other pollinators. These results suggest that it may be possible to strategically utilize fire to create and maintain particular structural and functional habitat attributes important for rare butterflies.

Hammer, Lyndia

Lyndia Hammer, Graduate Research Assistant, University of Missouri-Columbia, Lyndia recently completed a Master's Thesis on the subject of juniper expansion in a prairie-forest transition zone.

Oral presentation, Tuesday, 3:50 PM, C126

A Performance Test of Wildfire Burn Severity Assessments in an Oak Forest-Prairie Ecosystem

Recent large and severe wildfires in the south central US have generated interest in the use and accuracy of standard fire severity assessment methods in deciduous forest / prairie ecosystems. Standardized fire severity mapping methods (classified satellite imagery using the normalized burn ratio (NBR) and the composite burn index (CBI)) were largely developed in western US coniferous forests and have been little tested in the south central US. This study tests field-based and remotely-sensed methods of fire severity assessment to determine if standard methods can accurately classify fire severity. The study site was the Wichita Mountains Wildlife Refuge following the September 2011 39,907 acre Ferguson Fire. In July, 2012, an extended-assessment severity map was produced from classified satellite imagery (MTBS) and used to estimate fire severity for 340 pre-fire vegetation plots. Of these plots, we identified 120 plots occurring in four severity classes (unburned, low, moderate, high), re-measured post-fire vegetation characteristics, and measured the plot CBI. In this presentation, we will discuss the predictive relationship between field-based fire severity indices and remotely-sensed indices, fire severities by land cover type, and the utility of weighted CBI calculations.

Hankins, Don

Don L. Hankins is an Associate Professor in the Department of Geography and Planning at California State University, Chico. He is of Miwko (Plains Miwok) descent, and is a traditional cultural practitioner. Combining his academic and cultural interests he is particularly interested in the application of indigenous land management practices as a keystone process to aid in conservation and management of resources including the built environment. Since 2002 he has engaged in applied fire research involving indigenous California and Aboriginal Australian communities. Don has been involved in various aspects of land management and conservation for a variety of organizations and agencies including federal and tribal governments.

Oral presentation, Tuesday, 2:30 PM, B118

Fire, Biodiversity, and Cover in the Kaanju Ngaachi Indigenous Protected Area

Indigenous fire use is recognized as an integral ecosystem process in many global regions. Settlement history has led to altered fire regimes in many regions, which has reduced or virtually eliminated the role of indigenous people as stewards of their environments. In some locations the resultant changes to spatial and temporal relations of fire have reduced heterogeneity amongst species and their habitats. In 2008 the newly established Kaanju Ngaachi Indigenous Protected Area located in the Cape York Peninsula in Queensland, Australia, initiated the restoration of fire through traditional burning to protect and enhance biodiversity amongst other purposes for burning. This research presents the findings of baseline research of fire restoration in Eucalypt tetrodonta and Corymbia nesophila dominated woodlands by the Kuku I`yu traditional owners. Results suggest that biodiversity is greatest in sites burnt within recent years, and seasonal timing of burns can influence the structure and composition within these sites.

Hann, Wendel

Wendel J Hann, Landscape Fire Ecologist, US Forest Service Retired Notable achievement - Hann, W.; Bunnell, D. 2001. Fire and land management planning and implementation across multiple scales. International Journal of Wildland Fire. 10(3/4): 389–403. Wendel is an accomplished professional in landscape fire ecology, with over 40 years of experience. Wendel retired from the U.S. Forest Service in 2009 with more than 30 years experience ranging from early years fighting fires, packing mules, and clearing trails to later work in land management and prescribed fire to work in landscape ecology research to his last assignment as National Landscape Fire Ecologist. Wendel has a PhD from the University of Idaho, and MS and BS from Washington State University.

Oral presentation, Tuesday, 3:25 PM, B116

Fire Regime Condition Class (FRCC) – Testing of Guidebook Methods for LANDFIRE

We mapped Fire Regime Condition Class (FRCC) and associated layers for the LANDFIRE Refresh 2001 and 2008 across the contiguous lower 48 states and Alaska. Definitions and mapping methods followed the 2010 FRCC Guidebook (www. niftt.gov). The FRCC Guidebook effort was initiated in 2000 to provide fine to mid scale assessment methods tiered to the FRCC coarse-scale mapping definitions and management implications. Management implications included risk of loss of key ecosystem components, and changes in fire size and severity. FRCC was a composite measure of vegetation, fire frequency, and fire severity departures from historical. Fine to mid-scale FRCC Guidebook mapping methods have lacked inclusion of existing fire frequency and severity departures; thus vegetation departure and condition class have been used as a proxy for FRCC. In 2010 Guidebook methods were completed that included mid to fine scale fire frequency and severity. In 2011 LANDFIRE Refresh 2001 and 2008 disturbance data became available as inputs for mapping existing fire frequency and severity. For the LANDFIRE Refresh 2001 and 2008 we mapped biophysical settings, succession class, and fire frequency and severity. Using these data and modeled reference conditions we calculated departure for vegetation, fire frequency, and fire severity, and determined a composite FRCC. Substantial differences occurred between vegetation condition class and the composite FRCC. Strength of the three inputs; succession class, fire frequency, and fire severity appear to better address the definition of FRCC than use of vegetation condition class alone. The three inputs and composite FRCC are likely more suitable in addressing FRCC management implications as used in the National Fire Plan, Forest Service and Interior Cohesive Strategies, Healthy Forests Restoration Act, and other documents. In addition, research needs are identified.

Hanson, Chad

Chad Hanson has a Ph.D. in Ecology from the University of California at Davis, and focuses his research on the ecological relationships between rare wildlife species and higher-severity fire, as well as current landscape-level fire patterns and fire history. The montane conifer forests of the Sierra Nevada are a particular focus of his research.

Oral presentation, Wednesday, 1:40 PM, B112

The Role of Higher-Severity Fire in Suitable Habitat for Rare and Imperiled Wildlife Species

The presentation will review emerging scientific literature on the role of higher-severity fire in providing suitable habitat and important natural heterogeneity for rare and imperiled wildlife species, such as the Black-backed Woodpecker and the California Spotted Owl, emphasizing the ways in which new data are reshaping our understanding of not only the breadth of suitable habitat associations, but also the broad categorical definitions of suitable habitat itself. Initial results of Pacific fisher scat surveys in an unmanaged heterogeneous burned/unburned landscape dominated by mixed-severity fire will also be presented.

Hardy, Colin

Colin Hardy is Program Manager for the Fire, Fuel, and Smoke Science Program, Rocky Mountain Research Station, and is located at the Missoula Fire Sciences Laboratory in Missoula, Montana, USA. The 85+ people in his Program perform research and development in fire physical processes, fuel dynamics, fire ecology, smoke emissions and dispersion, and also develop tools and guidelines in support of fire and fuel management. Colin's career has involved research in smoke emissions from wildland fires, prescribed fire applications, and thermal infrared remote sensing. He was the principal investigator and national lead for development of Coarse-scale Spatial Data for Fire and Fuels Management, including the spatial implementation of the concept of Fire Regime Condition Class (FRCC) and departure indices.

Oral presentation, Thursday, 3:25 PM, B110

Have definitions and standards for fire severity, hazard, and risk improved since 1999?

In 1998 the General Accounting Office presented to Congress a comprehensive assessment of the wildfire threat to western national forests. The GAO report stated "In 1995, the [Forest Service] agency estimated that 39 million acres…are now at risk of large, uncontrollable, catastrophic fires." The national assessment and mapping effort to characterize this 'risk' used an approach by which historical fire regimes were mapped, then contrasted with spatial data regarding current ecological conditions. When this approach was discussed at the 1999 conference, 'Crossing the Millennium: Integrating Spatial Technologies and Ecological Principles for a New Age in Fire Management,' more than 20 other papers addressed topics relating to risk, severity, and hazard, yet most related papers then and since have used inconsistent wildfire risk terminology. One

of seven specific conference recommendations was: "More precise and consistent definitions and standards are needed for fire severity, hazard, and risk." Now, more than 13 years later, we discuss progress. One success is the increasing use of the term "uncharacteristic" to describing fire processes outside their biophysical baseline conditions. The national LANDFIRE and Fire Regime Condition Class efforts have been useful steps forward. The National Wildfire Coordinating Group's Glossary of Wildland Fire Terminology offers explicit definitions for risk, hazard, and severity. The Monitoring Trends in Burn Severity and Burned Area Emergency Rehabilitation efforts have spurred research on quantifying severity. We have begun to recognize that these terms, when used in both fire ecology and fire management, are becoming better integrated into multiple scales of time and space rather than simply being used to describe individual events or states. Advancing effective fire science and management depends on clearly linking conditions before, during and after fires which depends on clear, quantitative, measures of risk, hazard and severity.

Harling, Will

Will Harling is currently the director of the Mid Klamath Watershed Council and the Orleans Somes Bar Fire Safe Council. He is on the board of the Humboldt County Fire Safe Council, Fire Safe Council of Siskiyou County, and Siskiyou County Wildfire Protection Panel. He is also on the steering committee of the Northern California Prescribed Fire Council. Will was born and raised (and still resides) in the rugged and rural Western Klamath Mountains, one of the most diverse fire environments on the planet. Major wildfires that rewrote the landscape of his childhood have made him a lifelong advocate for better fire management policy. Past videos in conjunction with the Klamath Salmon Media Collaborative include "Lifestyles of the Rural and Fire Safe", and "Sparking a Change: Burning for a Fire Safe Community and Environment".

Oral presentation, Thursday, 11:25 AM, B116

Burning in the Backyard: The Role of Prescribed Burning in the Wildland Urban Interface

This presentation will tell the story of the grassroots prescribed burn program of the Orleans Somes Bar Fire Safe Council in Northwestern California, accomplishments to date, issues that have been encountered and how they were overcome, and the potential for expanded use of prescribed fire in the Wildland Urban Interface.

Harling, Will

(See biographical information, above.)

Video pesentation; Tuesday; 5:30, 6:30, and 7:30 showings; B113

Video: "Prescribed Fire in Northern California: Perceptions and Applications"

This 52 minute documentary provides an engaging and in depth perspective on the historic and current role of fire in the mountains of Northern California, land management and regulatory decisions that are framing the current use of prescribed burning, and what issues need to be addressed before meaningful steps can be taken to restore historic fire regimes at the landscape level. The film explains the issue of deferred threat with the suppression paradigm, and the relatively lower risk of carefully planned controlled burns. It also address various approaches to fire prevention and fire suppression, provide informed opinions on the costs and benefits of these approaches, and what we can expect in the near future in regards to fire and climate change, public opinion and changing land management objectives. Interviews with Jim Agee, Morgan Varner, Tim Ingalsbee, Matthew Hurteau, and fire managers, tribal members, and participants in the newly formed Northern California Prescribed Fire Council give a clear picture of the current situation with prescribed fire in the diverse habitats of the north state.

Harvey, Brian

Brian J Harvey is a PhD student in the Ecosystem and Landscape Ecology Lab at the University of Wisconsin, advised by Dr. Monica G. Turner. His research is focused on two major frontiers in disturbance and landscape ecology: changing disturbance regimes and disturbance interactions. Specifically, he is examining how two climate-driven disturbances (native bark beetles and wildfire) may lead to regional changes in western North American forest ecosystems. His research combines empirical field data with remote sensing and spatial analysis to evaluate how different conifer species of the Northern Rockies might vary in their response to changes in spatial heterogeneity of burn severity, and where are transitions to non-forest likely under future climate and disturbance regimes?

Oral presentation, Tuesday, 3:25 PM, C125

Spatial heterogeneity of burn severity in Northern Rocky Mountain forests (USA) between 1984 and 2011

Fire frequency and area burned are increasing in most parts of the world, but whether the spatial configuration of fire severity may also be changing is not known. Large datasets and powerful analytical tools now exist to study spatial variability in burn severity over space and time, but such efforts are often hindered by the limited availability of spatially and temporally extensive field data for calibration. We evaluated the relationship between satellite-derived measures of burn severity (differenced Normalized Burn Ratio [dNBR] and the relative version of dNBR [RdNBR]) and field measurements (e.g., tree mortality, postfire ground cover, fire-severity class) within 2 years after large fires that occurred in the Northern Rocky Mountains. Field data for fires that burned from 1988 to 2011 in Greater Yellowstone (n > 1,000 plots) were combined with data collected for fires that burned during 2011 throughout the Northern Rockies (n = 182 plots, from Greater Yellowstone to Glacier National Park). Mean RdNBR and dNBR values differed among burn-severity classes ($P < 0.05$), with high- and low-severity classes being more distinct than moderate severity. Thresholds were identified for each burn-severity class and we used RdNBR to map fire-severity categorically; model fit was assessed through cross-validation. Classes at the extreme ends of the burn-severity gradient (severe crown fire and unburned/low severity) were mapped with higher accuracy than moderate severity. We then compared metrics of spatial heterogeneity of burn severity among major forest types and topographic settings. Fires that burned in subalpine forests and in flatter topography had higher a proportion of high-severity burn than montane forests situated in more complex topography. Further, subalpine forests contained more area farther from unburned or low-severity edges. Understanding these differences in burn-severity patterns is critical for evaluating temporal trends in fire severity over large regions.

Haugo, Ryan

Ryan Haugo, forest ecologist for The Nature Conservancy. Ryan is leading the Tapash Sustainable Forests Collaborative in eastern Washington and the Clearwater Basin Collaborative in northern Idaho in developing comprehensive forest conservation and management goals that integrate ecological, social, and economic objectives.

Oral presentation, Wednesday, 1:40 PM, B116

An ecological context for "whole system" conservation of fire dependent forests across eastern Washington State

Forested landscapes across western North America are in crisis today; at risk of uncharacteristic disturbances that threaten both natural and human communities. Conserving these forests will require working at landscape scales and explicitly incorporating ecological processes along with the needs of human communities. By doing so, we can more effectively conserve and restore these extremely diverse and valuable ecosystems and build sustaining relationships between nature and people. This "whole systems" approach to conservation requires an accurate and comprehensive understanding of landscape context and current ecological conditions. The objective of this project was to assess the current ecological condition of forests across eastern Washington at landscape scales to facilitate development of forest conservation goals. Using LANDFIRE data on the historic and current forest structure and composition, we assessed the departure of current forest vegetation from historic conditions. Across eastern Washington State, approximately 73% of all forests are moderately or severely departed from historic conditions. Low severity fire regime forests are the most common forest type (2.3 million hectares) and 93% are moderately to severely departed from historic conditions. Mixed severity fire regime forests are also very abundant (2.1 million acres). While 52% are moderately to severely departed statewide, departure levels vary considerably between regions. The US Forest Service is the largest individual owner of forested lands in eastern Washington and patterns of departure by forest fire regime group did not differ between ownerships. This assessment underscores that need for active stewardship/restoration over large geographic areas in partnership with multiple land owners and managing entities. Specific forest conservation goals must also acknowledge that active treatment is not required on every hectare of departed forest and use of historic reference conditions must also consider the impacts of projected climate change.

Hawbaker, Todd

Todd J. Hawbaker received his B.S. degree in animal ecology in 1998 from Iowa State University. After receiving his B.S., he worked for a couple of years burning and restoring tallgrass prairie in southwestern Minnesota and then pursued graduate school. He received his M.S. degree in forestry in 2003 and Ph.D. degree in forestry in 2009 from the University of Wisconsin. He has been a research ecologist with the U.S. Geological Survey, Rocky Mountain Geographic Science Center in Denver, CO since 2008. His current research with the U.S.G.S. combines remote sensing with statistical and process-based ecosystem simulation models to examine the impacts of ecosystem disturbances on carbon stocks and fluxes.

Oral presentation, Tuesday, 11:25 AM, C125

Regional patterns of wildfire emissions in the conterminous United States

Wildfires are a critical component of the global carbon cycle producing an immediate release of greenhouse gases as biomass is consumed during combustion. Many studies have quantified greenhouse gas emissions from wildfires using a variety of fire atlases and satellite data; however, few have calculated emissions with fine spatial resolution data (< 1 km) and examined the patterns of emissions across the U.S. For this analysis, we asked (1) What were patterns and trends of wildfire emissions in the United States?, and (2) How did they vary among ecological regions? We calculated pixel-based emissions for each wildfire in the monitoring trends in burn severity database between 2001 and 2008 using the First Order Fire Effects Model, the LANDFIRE fuel loading models, and daily fuel moistures. Emission estimates were summarized by EPA Level 2 ecoregions, and within three broad regions of the United States: the East, the Great Plains, and the West. Across the coterminous U.S., annual emissions averaged 51.5 TgCO2-eq/year and ranged between 10.6 and 101.4 TgCO2-eq over the eight years. In the West, emissions averaged 36.7 TgCO2-eq/year and were as high as 75.3 TgCO2-eq in 2007. The Western Cordillera ecoregion, where fires predominantly occur in forested ecosystems, accounted for 77% of emissions in the West. In the Great Plains and the East, wildfire emissions were relatively lower than in the West and averaged 7.5 and 7.3 TgCO2-eq/year respectively. Emissions in the East were as high as 22 TgCO2-eq in 2008 mostly from fires of coastal woody wetlands. Emissions in the Great Plains, predominantly from grassland fires, reached as high as 25 TgCO2-eq in 2006 and 2008 when extensive areas were burned in Oklahoma and Texas. Our results demonstrate the utility of satellite-based burn severity and fuel load information for quantifying fire emissions across broad spatial scales. In addition to our results, we discuss limitations of our approach and future work that could potentially improve the methodology.

Heinsch, Faith

Faith Ann Heinsch is a Research Ecologist with the Fire, Fuel, and Smoke Science Program at the Fire Sciences Laboratory in Missoula, MT. Before that, she worked at the University of Montana with the Numerical Terradynamic Simulation Group (NTSG) in the College of Forestry and Conservation, where she analyzed vegetation productivity in response to current changes in climate and collaborated in climate change research, education, and outreach. Her research at the Fire Lab focuses on improving fire behavior and fire danger modeling systems (including the BehavePlus fire modeling system and the National Fire Danger Rating System) as well as continuing her climate change research.

Oral presentation, Thursday, 1:15 PM, C121

Challenges and Opportunities Regarding Wildland Fire and the Wildland Urban Interface during the next 20-30 Years

Wildland fire in the wildland urban interface (WUI) is becoming more expensive and difficult to manage. Increasing population, changing climate, and ecosystem health all determine the effect that wildland fire will have on the WUI. Eighteen current and former employees of the U.S. Forest Service were asked to describe the greatest challenges regarding wildland fire in the wildland urban interface (WUI) during the next 20-30 years. Participants represented the Rocky Mountain Research Station, the Northern Region, the Southwestern Region, and the Washington Office. Participant views encompassed several themes, including climate change; perceptions of fire in the WUI; improved understanding of fire, fuels, and smoke; and opportunities for planning. The results have been synthesized to describe what science is currently telling us and what we may expect in the next 20–30 years from both ecological and operational perspectives.

Heyerdahl, Emily

Emily K. Heyerdahl (Research Forester, USDA Forest Service, Rocky Mountain Research Station, Fire, Fuel, and Smoke Science Program) is a dendroecologist whose work focuses on reconstructing multicentury fire and forest histories from tree rings and from 20th-century archival records and identifying the drivers of their temporal and spatial variation (e.g., climate, land use, vegetation, and topography).

Oral presentation, Wednesday, 2:05 PM, B112

Fire and forest histories in mixed-conifer forests of central Oregon

Limited quantitative data exists on historical fire regimes in the mixed-conifer forests of central Oregon. We report on a multiscale dendrochronological study to characterize spatial and temporal variation in historical fire regimes (frequency, severity, landscape synchrony) and forest structure and composition across a range of forest types in central Oregon. We sampled more than 6,000 trees for establishment dates and/or fire scars at plots arrayed systematically across gradients in topography. Our six sites, covering about 800 ha each, include two mesic mixed-conifer sites on the east slope of the Cascade Range, three dry mixed-conifer sites in the Ochoco Mountains, and one lodgepole pine-ponderosa pine site on the pumice plateau east of Bend. At all sites, we reconstructed some tree-establishment dates from the 1300 or 1400s, but

most trees (>90%), established after 1600. Historical fire regimes were similar in mesic and dry mixed-conifer forests: surface fires burned extensively and frequently in the early portion of the record, but nearly ceased after the mid to late 1800s in the Ochocos and Cascades, respectively. Most sites experienced small patches of high-severity fire, although one dry mixed-conifer site experienced a widespread mixed-severity fire in the late 1600s. The lodgepole-ponderosa pine site historically sustained widespread mixed-severity fires. Other talks in our special session use these historical reconstructions from central Oregon to infer the drivers of past variation in fire, the departure of current forest structure from that of the past, and to model future fire regimes under different scenarios of climate and land use. All these approaches provide a context for forest management and ecological restoration.

Hoffman, Chad

Chad Hoffman is an assistant professor of fire science at Colorado State University. He received an A.S. Degree in Nuclear Engineering form 3-Rivers Technical College, B.S and M.S. Degree's in Forestry from Northern Arizona University and a Ph.D. in Forestry from The University of Idaho. His research focuses of wildland fire sciences, the application of physics based wildland fire modeling to current issues in fire and land management, validation of fire behavior models, fuels inventory and management, disturbance ecology and interactions.

Oral presentation, Tuesday, 11:00 AM, B115

Evaluating fire propagation across a range of bark beetle-induced mortality levels in southwestern ponderosa pine forests using FIRETEC

Landscape-level bark beetle outbreaks occurred in Arizona ponderosa pine forests from 2001-2003 in response to severe drought and suitable forest conditions. Field-based measurements showed that both the fuel loadings and the resultant forest structure were highly variable across a gradient of 20% to 100% mortality. To explore how the altered fuels complex would impact post-outbreak fire propagation, we used field-collected fuels data to create an analogous forest in FIRETEC, then simulated four levels of bark beetle-induced mortality across the analogous forest. The levels of mortality corresponded to the mean, high and low values measured across 60 bark beetle-affected field locations; we also included a no-mortality scenario. We then simulated fire propagation for two temporal stages following an outbreak: the red phase where foliage in dead trees remains in the overstory, and the grey phase where foliage from dead trees is deposited on the forest floor. Our preliminary findings suggest that the rate of fire propagation was increased during the red phase for all levels of mortality compared to the no-mortality scenario. Our data also indicate a positive relationship between the rate of fire propagation and the level of mortality. During the grey phase our data indicate a reduction in fire rate of spread for higher levels of mortality and a small reduction in rate of spread for lower levels of mortality. In general these simulations suggest that in addition to the time since outbreak, the level of mortality also plays a role in determining fire propagation rates.

Holden, Zachary

Dr. Zachary Holden works as a scientist for the US Forest Service in Missoula, Montana, and as an affiliate faculty member in the Department of Geography at the University of Montana. He completed his PhD in Natural Resource Management at the University of Idaho in 2007 where he studied spatial and temporal dynamics of historical wildland fires. His research now focuses on modeling interactions between fire, climate and vegetation in complex terrain. His recent publications include methods for modeling fine-scale surface air temperature variation in mountains, and application of those methods to characterize topographic influences on fuel moisture and fire danger for improving wildland fire management decision support.

Oral presentation, Wednesday, 3:25 PM, C121

Modeling Topoclimatic Influences on Fuel Moisture and Fire Danger with Distributed Sensor Networks in Complex Terrain for Improved Wildland Fire Management Decision Support

Fire danger rating systems commonly ignore fine scale, topographically-induced weather variations. Here, we present methods for incorporating terrain influences on climate into fuel moisture and fire danger estimates. We modeled the evolution of fuel moistures and the Energy Release Component (ERC) from the US National Fire Danger Rating System across the 2009 fire season using very high resolution (30m) surface air temperature, humidity and snowmelt timing models developed from a network of inexpensive weather sensors. Snow ablation date occurred as much as 28 days later on North-facing slopes than on South-facing slopes at similar elevations. South-facing slopes were hotter and drier than North-facing slopes. These factors created heterogeneous fuel moistures and fire danger across the study area. At peak fire danger, nocturnal cold air drainage and high relative humidity fostered fuel moisture recovery in valley bottoms, where fuel moistures

were 30% higher. Dry fuel moistures and relatively high ERC values persisted on low elevation, South-facing slopes. The driest conditions were observed 100-200 meters above the valley floor where mid-slope thermal belts frequently developed above areas of cold air drainage and pooling. We suggest that a complete understanding of terrain-induced variation in fuel moisture may help improve fire management decision making and has the potential to expand prescribed and wildland fire use opportunities. Data from a massive network of inexpensive sensors are being integrated into a real-time very high resolution snowmelt and fire danger forecasting system for the Northern Rocky Mountain West.

Holden, Zachary

(See biographical information, above.)

Oral presentation, Wednesday, 3:50 PM, C121

Does decreased orographic enhancement explain declining annual streamflows and recent increases in wildfire fire activity in the Pacific Northwestern US?

The influences of changing snowpacks on the hydrology of the western US have been well noted, with trends in snowpack declines, early streamflow timing and associated fire activity attributed primarily to warming temperatures. We present several lines of evidence suggesting that declines in high elevation precipitation have contributed to early snowmelt timing and reduced annual streamflow. Using satellite-derived estimates of area burned and area burned severely, we show that annual flow, an integrator of basin-wide precipitation explains a substantial amount of the variability in interannual wildfire activity in the Pacific Northwestern US. Precipitation and snowpack are fundamentally connected to the timing of snowmelt. Thus, while annual wildfire area burned is correlated with snowmelt timing, precipitation quantity and distribution provide a simpler mechanistic explanation of recent wildfire activity in this region. The magnitude of streamflow declines can't be explained by decreases in precipitation at low elevation weather stations, implicating declining orographic enhancement as a possible mechanism for the substantial declines in streamflow observed in recent decades.

Hollingsworth, LaWen

Fire Behavior Specialist for the Fire Modeling Institute, Missoula Fire Sciences Laboratory Rocky Mountain Research Station

Oral presentation, Tuesday, 1:40 PM, B115

Potential fire behavior in post-MPB lodgepole pine forests in south-central Oregon: Comparisons and lessons among Behave-Plus, FCCS, and FlamMap.

Mountain pine beetle (Dendroctonus ponderosae:MPB), a bark beetle native to the western U.S., has caused extensive lodgepole pine mortality in south-central Oregon, peaking at over 1,000,000 acres of mortality in 1986 and approximately 500,000 cumulative acres in the past decade. This widespread mortality has raised concerns related to potential fire behavior, effective fire management strategies, and firefighter safety as forest structure is altered following MPB epidemics. These concerns are magnified as previous research has provided equivocal evidence concerning post-MPB fire behavior and the uncertainty of applying currently available research and observational data as the lodgepole pine forests in south-central Oregon are topographically and ecologically unique (e.g., low cone serotiny, primarily climax lodgepole pine communities) compared to the remaining extent of the species' range. Using post-MPB fuels associations developed from a chronosequence sampling approach, we analyzed fire behavior using two point fire behavior systems: BehavePlus and the Fuel Characteristic Classification System. Additionally, we used a recently (2-10 years post-MPB) disturbed landscape to analyze geospatial fire behavior using FlamMap. The results from these efforts shall directly aid managers on both the Deschutes and Fremont-Winema National Forests by framing potential fire behavior in these post-disturbance environments. Thus, providing a basis to compare future observed fire behavior with predicted fire behavior as well as the uses, limitations, and assumptions associated with predicting fire behavior using the current suite of operational models.

Holsinger, Lisa

Lisa Holsinger, Ecologist, USA Forest Service. Lisa Holsinger specializes in GIS mapping and fire modeling in the Fire, Fuel, and Smoke Program at the Fire Sciences Lab. She has also worked in mapping and modeling vegetation and fire for the LANDFIRE project at the Fire Sciences Lab. Lisa received a MS from the University of Washington in fisheries and a BS in biology from the University of California Davis.

Oral presentation, Tuesday, 1:40 PM, B110

Impacts of climate change and wildfire on stream temperature and bull trout in the East Fork Bitterroot River

Thermal regimes in freshwater ecosystems are expected to change in response to anticipated increases in air temperature from rising concentrations of atmospheric CO_2. Projected changes in climate are also expected to change fire disturbance regimes across the western US, which may exacerbate stream temperature increases by intensifying direct solar radiation that reaches the stream surface. One important question in the northern Rocky Mountains is whether fire suppression and fuels treatment programs may decrease or increase risks for important aquatic species such as bull trout (Salvelinus confluentus) and other native salmonids that are sensitive to thermal stress. We linked a statistical regression model predicting stream temperature to a spatially explicit landscape fire and vegetation model (FireBGCv2) to explore interactions among vegetation, disturbance, climate and hydrology across a complex landscape in a northern Rocky Mountain watershed. Specifically, we were interested in how stream temperatures might respond to future climate change in a fire-prone watershed and the role that fire management actions such as fuel reduction and fire suppression could play in tempering stream thermal conditions. We found that air temperature clearly generated increases in stream temperature with a warming climate pushing cold-water refuges for bull trout to higher elevations. However, stream temperatures only minimally responded to climate-induced changes in wildfire disturbance and to fire management strategies. While additional refinement is needed to improve techniques for estimating fire disturbance effects on stream temperature, this study represents a useful approach for evaluating the relative magnitude of influence between air temperature and fire disturbance on stream temperatures and the potential significance to bull trout populations.

Homann, Peter

Peter Homann, Professor, Western Washington University. With colleagues from USDA Pacific Northwest Research Station, the National Forest System, and Oregon State University, we investigate whole-ecosystem C budgets at the Siskiyou-Rogue River Long-term Ecosystem Productivity study site, where forest stands have been experimentally altered. We had the exciting and unique opportunity to make direct measurements of wildfire influences on soils and woody fuels because postfire samples could be compared with our prefire samples. We linked above- and belowground processes when we found wildfire-induced soil C losses were positively related to the amount of woody fuels consumed, as presented in "Forest Soil Carbon and Nitrogen Losses Associated with Wildfire and Prescribed Fire" in Soil Science Society of America Journal, volume 75, pages 1926-1934.

Oral presentation, Thursday, 4:15 PM, C120

Decadal changes in post-wildfire detritus related to prefire forest structure

Wildfire-induced detrital losses are affected by prefire forest structure, including vegetation and woody debris characteristics. In this study, we examined how prefire forest structure also controls detrital responses during the first decade following wildfire. Prior to wildfire, forest structure was experimentally altered in a southwestern Oregon forest dominated by mature Douglas-fir [Pseudotsuga menziesii var. menziesii (Mirb.) Franco]. Thinning and clearcutting treatments were implemented to allow comparison with unaltered control stands. Prefire fine woody debris (1–10 cm diameter) loads ranked clearcut > thinned > control, consistent with expected slash inputs from harvesting. In the clearcut treatment, fine woody debris decreased to near zero during wildfire, and there was no recovery in the following decade, consistent with a lack of an overstory source. In the thinned treatment, fine woody debris decreased to near zero during wildfire, and regained 20% of its prefire mass in the following decade. This is consistent with input from the overstory trees, which suffered 94% mortality from wildfire. In the control treatment, fine woody debris decreased during wildfire to 30% of its prefire amount, then increased to its prefire mass during the following decade. This is consistent with input from the overstory trees, which averaged 47% mortality from wildfire. In the clearcut treatment, O horizon was nearly totally consumed during the wildfire, but regained 30% of its prefire mass in the following decade via inputs from herbs, shrubs and small deciduous trees. In the thinned and control treatments, O horizon decreased to near zero during wildfire, then increased substantially the following year as heat-killed needles from the overstory canopy were deposited on the surface. These results indicate the importance of different sources of detritus following wildfire in stands of varying structure. Projecting detrital responses to wildfire requires this understanding of how prefire forest structure influences post-wildfire dynamics.

Hudak, Andrew

Andrew T Hudak, Research Forester, RMRS, USDA Forest Service   PhD, University of Colorado, 1999 BS, University of Minnesota, 1990   Relevant Publications: Hudak, Andrew T., Ian Rickert, Penelope Morgan, Eva Strand, Sarah A. Lewis, Peter R. Robichaud, Chad, Hoffman, Zachary A. Holden. 2011. Review of fuel treatment effectiveness in forests and rangelands and a case study from the 2007 megafires in central, Idaho, USA. Gen. Tech. Rep. RMRS-GTR-252 Fort Collins, CO:

U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 60 p.   Hudak, A.T., P. Morgan, M.J. Bobbitt, A.M.S. Smith, S.A. Lewis, L.B. Lentile, P.R. Robichaud, J.T. Clark and R.A. McKinley. (2007) The relationship of multispectral satellite imagery to immediate fire effects. Fire Ecology 3(1): 64-90.

Oral presentation, Wednesday, 1:40 PM, C125

Field and remote assessment of fuel treatment effectiveness at the 2007 Egley Complex in central Oregon

Satellite data made available by the Monitoring Trends in Burn Severity project (MTBS) are highly valuable for assessing the ecological effects of wildland fire. Satellite image-derived indices available from MTBS include the differenced Normalized Burn Ratio (dNBR) and the Relative differenced Normalized Burn Ratio (RdNBR) delta indices of change induced by fire disturbance. We used these indices to assess the effectiveness of fuel treatments burned through by the 2007 Egley Complex (56,800 ha) in central Oregon. The 1985-2007 treatments in predominantly dry ponderosa pine forest covered 50% of the area within the Egley Complex perimeter and included commercial harvests (7280), pre-commercial thinnings (6855 ha), piling and burning (6853 ha), underburns (1566 ha), and prior wildfires (6100 ha) that we treated analytically as fuel treatments. In 2008, we assessed one-year post-fire effects on vegetation and soils at 35 paired field sites, with the treated site of each pair randomly located within a treatment unit and the untreated site randomly situated outside of the treatment unit. We used parametric paired t-tests and non-parametric Wilcoxon signed rank tests to quantify the significance of differences of field and remote variables of interest between treated and untreated sites. Tree mortality, canopy closure, percent green or charred tree canopy, percent surface cover of green vegetation, ash, char, soil, and litter, and litter depth all differed significantly. All of the MTBS satellite image-derived burn severity indices showed highly significant ($p < 0.001$) differences. Landscape-level analysis of dNBR reveals that treatments <10 years prior to the wildfire were more effective at reducing burn severity, relative to untreated areas, than treatments >10 years prior to the wildfire. We conclude that a variety of silvicultural treatment strategies are effective at reducing fuel loads and consequently mitigating severe wildfire effects.

Huffman, Mary

Mary R. Huffman, Landscape Conservation Network Director, The Nature Conservancy   Mary is a long time fire practitioner and conservation program builder in The Nature Conservancy. She recently earned her Ph.D. studying community-based fire management within La Sepultura Biosphere Reserve in Chiapas, Mexico.

Oral presentation, Thursday, 3:50 PM, C121

FireScape Monterey: Moving Beyond Conflict into the New World of Fire

"The fact that we've been working together for a year and we're still talking to one another is remarkable" said Kerri Frangioso, researcher from UC Davis and local fire brigade member. Kerri's observation reflects the early progress of a group of adversaries participating in a collaborative group called FireScape Monterey. Several things stand out about this group among 45 others in the Fire Learning Network, a cooperative program of the Forest Service, four Department of the Interior agencies and The Nature Conservancy. Stakeholders in this group are taking a chance by putting down their weapons (temporarily) and putting their heads together to solve fire problems that are beating everyone in their landscape – forest managers, ranchers, Native Americans, Wilderness advocates and community residents alike. Learn the process that 100 people from 30 organizations participanting in FireScape Monterey have used to discover shared values and to formulate action-oriented strategies to reach its vision: to promote protection of both life and property affected by wildfire and healthy resilient ecosystems in the Northern Santa Lucia Mountains through collaborative stewardship.

Hummel, Susan

Susan Hummel was born and raised in Oregon and received her bachelor's degree from Georgetown University. She worked and traveled in tropical and temperate forests before returning home to the Pacific Northwest to earn her doctorate at OSU. Susan is a scientist at the USDA Forest Service PNW Research Station. She focuses on understanding forest structural dynamics, including how different management practices affect resources people care about and the potential costs associated with different choices.

Oral presentation, Tuesday, 2:30 PM, C122

Assessing forest vegetation and fire simulation model performance after the Cold Springs wildfire, Washington USA

This presentation focuses on the accuracy of Forest Vegetation Simulator (FVS) predictions across suites of model outputs and the sensitivity of estimates made by the Fire and Fuels Extension (FFE-FVS) to weather, disease, and fuel inputs. In-

novations of the analysis are (1) the comparison of post-fire, field measurements to model simulations based on pre-fire data for the same location and (2) the simultaneous evaluation of multiple model outputs. For each set of projected, pre-fire stand conditions, a fire was simulated that approximated the actual conditions of the Cold Springs wildfire as recorded by local portable weather stations. We also simulated a fire using model default values. The FFE-FVS extension uses a tree list and information on stand history and cover or habitat type to select one (or more) fuel models that represent fuel conditions. Selected fuel models are then used to predict fire behavior. From the simulated post-fire conditions, values of tree mortality and fuel loads were obtained for comparison to post-fire, observed values. We designed eight scenarios to evaluate how model output changed with varying input values for three parameter sets of interest: fire weather, disease, and fuels. All of the tested model outputs displayed some sensitivity to alternative model inputs across 28 scenario pairs. Our results indicate that tree mortality and fuels were most sensitive to whether actual or default weather was used and least sensitive to whether or not disease data were included as model inputs. The performance of FFE-FVS for estimating total surface fuels was better for the scenarios using actual weather data than for the scenarios using default weather data. For fine fuels and litter it was rare that any stand met the selection criterion. Our results suggest that using site-specific information over model default values could significantly improve the accuracy of simulated values.

Hunter, Molly

Molly E. Hunter, Assistant Research Professor, Northern Arizona University. I conduct research on fire ecology and effects throughout the southwestern United States and I work as a writer and editor for the Joint Fire Science Program.

Oral presentation, Tuesday, 11:25 AM, B114

Historical and current fire management practices in two southwestern wilderness areas: Saguaro National Park and the Gila National Forest

Forest managers across the southwestern United States are increasingly using wildfire to accomplish fuels and restoration objectives. Similar circumstances initially propelled the use of wildfire in large wilderness areas within the Gila National Forest in New Mexico and Saguaro National Park in Arizona in the early 1970's. After decades of wildfire management, managers in these two wilderness areas offer a wealth of knowledge. Such knowledge is vital to managers who are now beginning to use wildfire as a restoration tool. With a thorough literature review, we document the historical fire regimes, the evolution of fire management, and ecological effects of fire in these two wilderness areas. Through conversations with several key managers we document important lessons learned over the several decades that wildfire use has been practiced in these wilderness areas. All this information will be published in a synthesis and be made available to those who utilize wildfire for restoration and fuels reduction.

Hyde, Kevin

Kevin Hyde completed the reported study as part of doctoral studies at The University of Montana where he is currently an adjunct instructor of watershed hydrology. During his tenure as a contract researcher for the Rocky Mountain Research Station, he received the US Forest Service Chief's Award as the technical lead for the Rapid Assessment of Values at Risk (RAVAR) module of the Wildland Fire Decision Support System (WFDSS).

Oral presentation, Tuesday, 1:15 PM, C125

Predicting Post-fire Gully Rejuvenation Using Full-scale BARC

Prediction of severe erosion following wildfire benefits ecosystem assessments and may serve to protect human populations from flood and debris flow hazards. This study, based in the US Northern Rockies, researched the relationship between fire effects and the probability of gully rejuvenation. Fire effects were measured using unadjusted, full-scale burned area reflectance classification (BARC) images. Prior studies report that BARC images most accurately measure vegetation disturbance by fire. Gully rejuvenation, the most intense form of post-fire erosion, was identified and mapped through direct field observation. The probability of gully rejuvenation was strongly correlated with vegetation disturbance with only minor influence of catchment relief, shape, and pre-fire shrub cover. These findings contradict the conventional belief that post-fire erosion is most influenced by fire effects on soils and support the conclusion that the degree of vegetation disturbance exerts primary control over the probability of erosion response. The application of BARC images developed in this study may support more rapid and consistent assessment of erosion probability and hazard analysis following wildfire.

Hyp, Ian

Ian Hyp is a dedicated young forestry technician with the Rocky Mountain Research Station in Missoula, Montana who has helped to develop and carry out various projects in disturbance ecology. These include projects looking at the resilience of post treatment small mammal populations, goshawk habitat studies, various dendrochronology based fire history studies, post disturbance tree anatomy response, and a paleoecology based fire history calibration for use in climate change studies.

Oral presentation, Wednesday, 11:00 AM, C120

Comparison of Charcoal and Tree-Ring Records of Recent Fires in The Northern Rocky Mountains, Kalispell, MT, USA

In the Northern Rocky Mountains, climate and vegetation histories have been developed using charcoal and pollen deposits in the sediment of lakes to determine the effect of changing climate on species distribution and disturbance regimes through time. However, few studies have been done on the spatial and temporal accuracy of these charcoal and pollen sediment strata analyses. In this study we created a dendrochronological fire history using fire-scarred trees in the watershed of Foy Lake in the Flathead Valley, MT, to determine the synchronicity between two fire proxies: the watershed's tree fire scar chronology and the dated charcoal in the sediment lake strata. I also compared Foy Lake's charcoal profile to six other tree-ring based fire histories that were developed within 120 kilometers of Foy Lake to evaluate the registry of regional fires in Foy Lake's charcoal sediment fire history. I found that of the 31 fire years shared among tree-ring fire history sites in the region, 12 registered as significant charcoal peaks in Foy Lake. Of those 12 fire years, eight of them took place in the Foy Lake watershed. Also, of the 19 filtered fire years with two or more scars found in the Foy Lake watershed, only seven corresponded with charcoal peaks in the lake with little or no lag time, but fire years with only one scar found matched most and left few charcoal peaks unaccounted for. This study will enable paleoecologists to better interpret charcoal sediment results, assured that local charcoal deposition is likely the primary contributor to a lake's sediment charcoal record. Large fire years that did not occur in the local watershed may not register in the lake strata, and climate inferences from charcoal particle presence in a single lake may be skewed.

Ingalsbee, Timothy

Timothy Ingalsbee, Ph.D.   Executive Director   Firefighters United for Safety, Ethics, and Ecology (FUSEE).   In 1993 Timothy received the Oregon Conservationist of the Year Award by the Oregon Natural Resources Council for his work as a fire ecology advocate, and in 2002 he served on the Western Governors' Association's stakeholder group that developed implementation tasks and performance measures for the Ten-Year Comprehensive Strategy and National Fire Plan. Timothy is a senior wildland fire ecologist certified by the Association for Fire Ecology.

Oral presentation, Wednesday, 1:15 PM, B111

Incendiary Rhetoric: Envisioning Alternative Science and Management Terminology to Promote Public Support for Fire Use and Ecological Fire Management

Smokey Bear was a joint creation of the U.S. Forest Service and the War Advertising Council to mobilize public support for the agency's fire exclusion and suppression policies, and is widely recognized as one of the world's most successful advertising campaigns. Smokey Bear's campaign is also a classic example of propaganda, the intentional, systematic attempt to shape perceptions, manipulate cognitions, and direct behaviors towards desired social or political objectives.   With recent reforms in federal fire policy, managers now desire to use more fire (e.g. controlled burning and wildland fire use) to maintain and restore fire-adapted ecosystems. However, there remains strong public and political opposition to wildfires and fire use due to what some managers refer to as "the Smokey Bear syndrome," namely, the success of anti-fire propaganda.   Smokey Bear's fire prevention message has been modified, and federal agencies have developed new educational materials that promote limited fire use, however, public perceptions and attitudes about wildland fire are largely shaped by the newsmedia which frames most of its fire coverage with the "war metaphor" and "catastrophe mentality." The media's explicit anti-fire bias must be changed if the public is to support greater fire use, but that will be difficult to accomplish unless and until much of the technical terminology of fire ecology and management is changed to remove its own implicit anti-fire bias.   This presentation will provide a critique of fire science and management terminology and media frames that perpetuate anti-fire attitudes. Suggestions for alternative terms, metaphors, and rhetorical frames that promote ecological fire management and fire use practices will be offered. In essence, the presentation will argue that the wildland fire community must develop new pro-fire language with intentionality and systematically use it in a pyroganda campaign with as much moral fervor as Smokey Bear waged his anti-fire propaganda campaign.

Iniguez, Jose

Jose Iniguez, Research Ecologist with Rocky Mountain Research Station. Most recently I have been working on a series of studies in the Gila National Forest studying the impact of prescribed, fire-use and wildfires on tree spatial patterns and forest structure. Previous work has included classification of vegetation types in the Sky Islands of Southeastern Arizona, as well as studying landscape fire history patterns in the Santa Catalina and Rincon Peak.

Oral presentation, Tuesday, 1:15 PM, B114

The Gila Wilderness as a natural landscape experiment for ponderosa pine forests

Southwestern ponderosa pine forests evolved under a frequent surface fire regime that created a mosaic of tree groups among a savanna matrix. Across the Southwest, most of these original forests have been significantly altered by logging, fire suppression or both. The Gila wilderness however was established in 1924 as the first wilderness area in the United States and was therefore never logged. In addition, although the fire regime has been altered, frequent surface fires have been restored to most of the areas within the wilderness in recent decades. This management history in provides a unique outdoor ecological laboratory to study forest structures and fire processes. Over the last several years we have initiated a series of ecological studies to determine the impact of managed fires on fuels, age structure and tree spatial patterns both in and outside the Gila wilderness. Our results show that re-introducing fires to these fire-dependent forests has restored tree densities and spatial patterns to historical conditions. Hence these forests may be important qualitative and quantitative reference sites which can serve to guide restoration efforts across the Southwest.

Ireland, Kathryn

Kathryn Ireland is a Ph.D student in the School of Forestry at Northern Arizona University. Her research is focused on understanding historical links between climatic conditions, forest fires, and forest communities. She received a master's degree in ecology from Montana State University in 2003. After completing her master's, she worked on the LANDFIRE project at the Forest Service's Missoula Fire Sciences Laboratory and then as a wetland biologist/vegetation ecologist in Alaska before beginning her Ph.D. at NAU.

Oral presentation, Tuesday, 2:30 PM, B110

A process-based approach to modeling the response of vegetation communities and fire regimes to climatic change in northern Arizona

Throughout much of the western United States future climates are expected to be both warmer and drier, with most models predicting an increase in the frequency and severity of droughts and a general drying trend for the Southwest. Climatic changes are likely to affect many aspects of ecosystems, including the structure, composition, and productivity of vegetation communities. Many trees species are likely to experience widespread mortality, particularly at their lower latitudinal and elevational limits. Rapid and severe dieback and mortality of aspen has been observed throughout much of the western United States in recent decades, which has generated concern among scientists and land-managers for the long-term persistence of aspen forests. Aspen mortality is particularly high in northern Arizona, which is at the southwestern limit of aspen's contiguous range in North America. Using the mechanistic process model FireBGCv2, we investigated shifts in tree species distributions and changes to future fire regimes in response to different climate change scenarios and two fire management scenarios (all fires allowed to burn, full fire suppression) in the San Francisco Peaks of northern Arizona. We will present preliminary results for this region, with a focus on the interacting influence of changing climatic conditions and fire regimes on aspen communities.

Jacobs, Derric

Derric B. Jacobs is a Ph.D. candidate in the Environmental Sciences at Oregon State University. He is working on the Forest, People, Fire project, a National Science Foundation funded project with the USDA Forest Service and Oregon State University. Christine S. Olsen, Ph.D. is a research associate with the College of Forestry, Department of Forest Ecosystems and Society at Oregon State University. She is currently working on the Forest, People, Fire project with the USDA Forest Service and Oregon State University. Paige Fischer, Ph.D. is a research social scientist with the USDA Forest Service, Western Wildland Environmental Threat Assessment Center. She is currently working on the Forest, People, Fire project with the USDA Forest Service and Oregon State University.

Oral presentation, Wednesday, 3:50 PM, B113

Social networks in communities around fire-prone forests.

Fire-prone forests consist of complex socio-ecological systems where social, economic, political and ecological systems are intimately interlinked with variables often impacting others across disciplinary boundaries. Increasingly, ecological studies are including social scientists from a variety of disciplines to better investigate these coupled human and natural systems (CHANS). This presentation focuses on the study of social networks and how they are connected to the landscape as part of the Forest-People-Fire (FPF) project in central and south-central Oregon. The FPF project has three independent studies investigating social networks, each with different levels of analysis and distinct boundaries that together provide a comprehensive view of how networks function in the region and how the landscape may be altered by network presence and structure. The first study is an analysis of the networks of agencies and organizations related to forest and fire management within the entire study area. The second study looks at individuals within designated WUI areas and their relations to each other and organizations, and how this influences their decisions about property and home management to reduce fire risk. The third study analyzes two bounded communities within the study region and the social networks within these communities. Together, these three studies are expected to illuminate how social relations between organizations, between organizations and individuals, and between individuals influence land management decisions and resulting landscape patterns. We will present the theory and methods of studying social networks and the preliminary results that are available from the three studies in this project.

Jain, Theresa

Theresa B. Jain, Research Forester from the Forest Service, Rocky Mountain Research Station is nationally recognized as a leader in silviculture and fire science, particularly in the field of fuels management. Theresa has received a Forester of the Year award from the Inland Empire Society of American Foresters and a national award for outstanding contributions in the field of silviculture from the U.S. Forest Service. Theresa's proud of being a member of professional societies such as the Society of American Foresters and the Association of Fire Ecology, because they contribute to what she most enjoys about her job, which is working with managers to solve the challenges they face in managing temperate forests into the future.

Oral presentation, Thursday, 2:05 PM, B111

A comprehensive guide to fuels management practices for dry mixed conifer forests in teh northwestern United States

The Dry Mixed-Conifer Fuel Synthesis provides information regarding the benefits, opportunities, and trade-offs among the different strategies related to fuel treatment applications. Our geographic area includes the forests in northern California and the Klamath, Pacific Northwest interior, northern and central Rocky Mountains, and the Great Basin (primarily in Utah). To provide regional and site-specific context to this document, we visited federal, state, and tribal land entities and interviewed over 50 resource specialists throughout the synthesis area. Comments and discussions generated via this interview process and through the literature review guided both the organizational format and content. The synthesis is organized under three sections. The first section focused on the ecology of dry mixed conifer forests and emphasizes the forest elements that provide context for fuel treatment planning and implementation. Section II provides the tools, techniques, equipment, and details associated with fuel treatment planning and implementation. Section III focuses on the challenges and opportunities of fuel treatment implementation and covers at least conceptually, what can and cannot be achieved through the removal of fuels. There are three aspects that make this synthesis unique. The information we provide is designed to enhance communication among disciplines and stakeholders. We use Forest Inventory and Analysis information to provide current condition and economic feasibility. We consider this synthesis as a portal to more detailed literature and synthesis that can be accessed via the web version of this document using an interactive literature cited database. I will provide an overview of each of the section and focus on the most important elements that make this synthesis unique.

Jain, Theresa

(See biographical information, above.)

Oral presentation, Thursday, 2:30 PM, B111

A Silviculture System Designed to Meet Fuel and Restoration Objectives within Complex Moist Forests of the Northern Rocky Mountains

We will discuss the concept, implementation, and feasibility of silvicultural methods that enhance resilience, restoration and fuels in the northern Rocky Mountains, USA. These methods are designed to be uneven-aged and focus on maintaining multiple tree densities and canopies, while favouring environments for successful regeneration and development of early-seral species. Resilience, restoration and fuel treatments in the northern Rocky Mountains are complex and far different from those applicable to dry climax ponderosa pine forests. To address these objectives, we are developing and implementing integrative silvicultural methods and systems that are applicable for regenerating and growing a variety of species (early- to late-seral species), while maintaining forest characteristics that are relevant to many contemporary for-

est management objectives. These methods maintain multiple tree densities, a variety of canopy cover, and can enhance old-forest attributes and most importantly, the harvesting, mastication, grapple piling, and prescribed fire treatments we applied will modify both wildfire intensity and burn severity. We found that the heterogeneous forest structures we created, even with small openings (average size 2.6 ha) and the minor proportion of the landscape (3 percent) treated, would alter a wildfire's flame length, and fire type, according to FlamMap and FARS ITE wildfire simulations. This analysis showed the placement, juxtaposition, and location of treatments within the landscape did alter how the fire progressed through the treatments under weather conditions that occurred during one of the worst fire seasons (1967) in the northern Rocky Mountains. In addition to developing and implementing the irregular selection silvicultural methods we also conducted a cost analysis where we compared mastication, grapple pile and burn, and prescribed fire. We will discuss the concept, implementation, and feasibility of irregular selection at meeting resilience, restoration, and fuels management objectives.

Jain, Theresa

(See biographical information, above.)

Oral presentation, Thursday, 1:15 PM, C125

Index for characterizing post-fire soil environments in temperate coniferous forests

Many scientists and managers have an interest in describing the environment following a fire to understand the effects on soil productivity, vegetation growth, and wildlife habitat, but little research has focused on the scientific rationale for classifying the post-fire environment. We developed an empirically-grounded soil post-fire index (PFI) based on available science and ecological thresholds. Using over 50 literature sources, we identified a minimum of five broad categories of post-fire outcomes: (a) unburned, (b) abundant surface organic matter (>85% surface organic matter), (c) moderate amount of surface organic matter (≥40 through 85%), (d) small amounts of surface organic matter (<40%), and (e) absence of surface organic matter (no organic matter left). We then subdivided each broad category on the basis of post-fire mineral soil colors providing a more fine-tuned post-fire soil index. We related each PFI category to characteristics such as soil temperature and duration of heating during fire, and physical, chemical, and biological responses. Classifying or describing post-fire soil conditions consistently will improve interpretations of fire effects research and facilitate communication of potential responses or outcomes (e.g., erosion potential) from fires of varying severities.

Jenkins, Michael

Dr. Jenkins is a Professor of Forestry at Utah State University where he teaches and conducts research in Disturbance Ecology and Management. His current research interests include the interaction of bark beetles, fuels and fire in western conifer forests.

Oral presentation, Tuesday, 2:30 PM, B115

Diurnal variation in foliar moisture content of lodgepole pine in the red stage of mountain pine beetle attack

Widespread outbreaks of the mountain pine beetle (Dendroctonus ponderosae Hopkins) in lodgepole pine (Pinus contorta Dougl. ex Loud. var. latifolia Engelm.) forests have created stands with significant levels of recent mortality. The needle foliage from recently attacked trees typically turns red within two years of attack indicating successful colonization by the beetle and ultimately tree death. Users of fire behavior modelling systems have assumed that the red needles respond similarly to changes in air temperature and relative humidity as surface needle litter. In this study we quantified the diurnal variation of dead foliar moisture content from trees containing red and dead needles, and compared the observations to predictions made with common models used to estimate fine dead fuel moisture in North America and Australia. Results indicated that all but one of these models are incapable of estimating dead foliar moisture content as a result of the small degree of variation in observed dead foliar moisture content across the diurnal cycle. Linear models were built and validated from the observational data to predict dead foliar moisture content, which performed relatively well. We suggest that a nominal moisture content of 10% is representative of the conditions encountered during this study.

Johnson, Morris

Morris Johnson is a Research Fire Ecologist with the Pacific Wildland Fire Science Laboratory, Pacific Northwest Research Station located in Seattle, WA. He began his Forest Service career as a Forest Ecologist CO-OP student on the Prospect Ranger District, Rogue River National Forest in 1994. He was he was a member of the Redmond Interagency Hotshot crew (1999) and Redding Interagency Hotshot crew (2001). He received his B.S. in Urban Forestry from Southern University in

1996; M.S. in Silviculture and Forest Protection from the University of Washington in 2002, and Ph.D. in Forest Ecosystem Analysis from the University of Washington in 2008.

Oral presentation, Tuesday, 11:25 AM, B116

Evaluating fuel treatment efficacy on Arizona's largest wildfire

In 2011, the Wallow fire, Arizona's largest recorded wildfire, burned 215,000 hectares on the Apache Sitgreaves national forest, USA. Prior to the fire ignition, < 21,000 hectares had been treated to reduce wildfire hazard around several (WUI) communities. Our study objectives were (1) to compare burn severity, tree mortality, fuelbed characteristics (basal area, tree densities) between treated and burned and untreated and burned area adjacent to WUI communities; (2) to determine which thinning prescriptions were most effective in reducing tree mortality and crown scorch; and (3) to quantify the spatial extent of treatment at which fire severity was effectively reduced from untreated high severity areas. We installed linear transects across untreated/burned and treated/burned stands. To evaluate treatment effectiveness, we characterized stand structural characteristics associated with treated areas and compare those to untreated areas. We calculated summary statistics for all stand inventory data and tested for differences in stand structure between treated and untreated stands using t-tests for normal data (or transformed to normal data) and Wilcoxon rank-sum tests for non-normal data. We plotted crown scorch against distance to treatment edge in the treated area, and found that a Weibull curve could be fit to the data using the nls function in the R statistical software. Treated areas had significantly lower basal area, stem density, canopy bulk density, and a significantly higher quadratic mean diameter. Distance to treatment edge was a strong predictor of fire severity in the treated area. We found that crown scorch in the treated area increases with increasing basal area, increasing stem density, and increasing crown bulk density. Crown scorch in the treated area decreases with increasing crown base height. These results will help fire and resource managers develop effective thinning treatment prescriptions and treatment size required to reduce wildfire effects.

Johnson, Morris

(See biographical information, above.)

Oral presentation, Tuesday, 1:15 PM, B116

Effects of salvage logging and pile-and- burn on fuel loading, potential fire behavior, fuel consumption, and emissions after a windstorm

We used a combination of field measurements and simulation modeling to quantify effects of salvage logging and pile-and-burn surface fuel treatment on fuel loadings, predicted fire behavior, fuel consumption, and emissions after a major windstorm. We performed a repeated measures analysis of variance to compare measured mean levels of fuelbed depth, sound and rotten fuel loadings (1-, 10-, 100-, 1000-, 10,000-hr), modeled estimates of flame length, fire rate-of-spread, reaction intensity, fuel consumption, and emissions at three points in time: post-windstorm (before salvage logging), post-salvage logging, and post-surface fuel treatment (pile-and-burn). Salvage logging and the pile-and-burn surface fuel treatment significantly reduced fuel loadings, fuelbed depth, and simulated smoke emissions. However, our results did not produce unequivocal evidence that salvage logging and surface fuel treatment decreased potential wildfire behavior; results varied depending on the software program and selection of fuel models. We suggest that both past management history and salvage logging methods (whole tree harvest) influenced findings at our study sites and that additional studies will be needed to confirm applicability to other sites and operations.

Johnson, Timothy

Dr. Timothy J. Johnson, Senior Research Scientist at the Pacific Northwest National Laboratory is a member of a team involved in building the Northwest Infrared Database, a vapor-phase infrared spectral library used for a multitude of purposes, including environmental monitoring, fence-line monitoring, hazardous material response, and general scientific research. Dr. Johnson is part of an EMSL-based team for collaborations involving fundamental spectroscopy, both infrared and Raman, and is also working to develop infrared sensors, both FTIR-based and laser-based systems for atmospheric chemical sensing.

Oral presentation, Thursday, 1:40 PM, C122

First Look at Smoke Emissions from Prescribed Burns in Long-unburned Longleaf Pine Forests

While fire has long played a role in the longleaf pine ecosystem, there are still some stands in the southeastern United States where fire has not been reintroduced and fuels have accumulated for 50 years or more. As part of a larger study

examining fuel loading and smoke emissions on Department of Defense installations in the South, we measured fuels and trace emissions on three prescribed burns totaling 126 ha at Ft. Jackson Army Base near Columbia, South Carolina in November 2011. Last known fires on the three burn sites occurred in 1957, 1956, and 2003. Due to access constraints because of active training, we typically sampled fuels the day of the burn. Smoke emissions were measured on the ground and from an aircraft by scientists from the University of Montana, Colorado State University, the Forest Service Rocky Mountain Research Station, the Environmental Protection Agency, and the Pacific Northwest National Laboratory. Concentrations of twenty-two gas species were measured using an airborne FTIR instrument and seventy-six gas species were measured off-line by whole-air sampling. Selected emissions data will be compared with similar emissions data collected from prescribed burns sampled in coastal North Carolina in 2010 in younger fuels beds in loblolly/longleaf stands at or near Camp Lejeune.

Kaib, Mark

Mark is the Deputy Regional Fire Management Coordinator for the U.S. Fish and Wildlife Service in Albuquerque, New Mexico. He began his career in fire as an Arizona hotshot crewmember for the USFS in 1982. He worked on hotshot, engine, and helitack crews for the USFS, NPS, and BLM. He was a hotshot superintendent and also worked in Alaska with Native American Crews. Mark has travelled extensively and also worked overseas in Latin America, Southeast Asia, and throughout Africa. Mark attended graduate school where his research in the Southwest and Mexico included a multidisciplinary approach to reconstruct differences in forest fire histories and cultural patterns using tree-ring evidence, documentary sources, and ethnographical methods. His current job includes application of fire science and experience to management of National Wildlife Refuges.

Oral presentation, Wednesday, 2:05 PM, C122

Strategic Framework to Mitigate Wildfire Threats and Effects to Southwest Riparian Ecosystem Services

Southwestern riparian ecosystems provide relatively significant landscape and regional biodiversity and ecosystem services. Unfortunately these highly-valued ecosystems have been extensively altered, hydrologically and ecologically via water control, exotic-invasive species and changing fire regimes. Although their fire ecology is poorly understood, these ecosystems are typically the most productive, surrounded by other frequent-fire adapted ecosystems, and thus difficult to envision them not burning regularly in past. Epicormic stem and root sprouting by native riparian species are adaptations to flooding that can also be fire adaptations. Nonetheless these ecosystems are now extremely vulnerable to increasing wildfire frequency, size and severity. Major ecological transformations over the last century have resulted in unsustainable hazardous-fuel loading that threaten further degradation of considerable multifold ecosystem services. Costly restoration projects have had mixed results and may not effectively reduce fire threats. General widespread hazardous fuel and exotic species treatments have often not been ecologically or economically viable, because of high costs for implementation and maintenance, exotic species propagules that virtually always exist on adjacent lands and upstream, and valid concerns about cumulative treatment effects on wildlife habitat and ecosystem services. Fire managers know that strategically placed fuel breaks can significantly enhance their fire response efforts, and if well placed, can alter the trajectory of wildfire effects over larger landscapes. A more strategic and sustainable approach based upon values at risk, more efficient use of limited resources, and commonsense placement of fuelbreak networks can potentially reduce the broader-scale threat and effects of wildfires. Strategically placed shaded-fuel breaks provide an example to reduce fire risk, while also limiting broader treatment effects to wildlife habitats. A comprehensive strategy that includes planning, prevention, preparedness, and a decision framework is proposed to help resource managers, to mitigate further degradation of ecosystem services, and to enhance resilience and adaptive capacities of these keystone ecosystems in the context of future wildfire trajectories and climate change.

Kane, Jeffrey

Jeffrey Kane, PhD. Assistant Professor of Wildland Fire Ecology and Management Over the past 5 years, Jeff has published 10 peer-reviewed articles in reputable journals on varied topics regarding the ecology and management of fire prone forests.

Oral presentation, Thursday, 11:00 AM, C121

Exacerbated synergisms: the potential impacts of increased interactions between fire and other disturbances on tree mortality

Intereactions between fire and other disturbances (e.g. insects, disease, and drought) have long influenced forest dynamics in much of the western U.S. However, climate change-associated increases in temperature concurrent with other human-mediated changes will likely have strong impacts that are unanalgous to historical conditions. While we are increasing our

understanding of how global changes have influenced these disturbances individually, we lack much understanding how synergistic relationships among disturbances in these forests work and how they will be affected. Here we provide conceptual overview including potential and observed interactive effects on tree mortality in fire-prone forests of the western U.S. As a result, we suggest that the frequency and magnitude of interactions between fire and other disturbances will be amplified within many forest types, which will increase the probability of tree death. More specifically, we suggest that increases in drought, bark beetle attack, and invasive pathogen presence in combination with increased fire activity will contribute to greater tree mortality. To support our position we provide a theoretical framework with documented examples of how altered synergisms may influence fire-related tree mortality in four different forest ecosystems. These non-additive effects of disturbance synergisms may contribute to accelerated forest loss and rapid range shifts in some tree species that may not be accounted for in current climatic envelope models.

Kane, Van

Van R. Kane, PhD Research Associate School of Environmental and Forest Sciences University of Washington   Dr. Kane has specialized in using airborne LiDAR to measure the impact of fire, disturbances, and topography on forest structure at landscape scales.

Oral presentation, Tuesday, 4:40 PM, B112

Landscape Scale Changes to Forest Structure Changes With Different Fire Severities in Yosemite National Park

While the effects of different fire severities on forest structure have been studied at local scales, the cumulative effect of fires and different severities across landscapes have been difficult to evaluate. We measured these cumulative effects in Yosemite National Park, which has been subject to numerous fires in recent decades. Fire severity was estimated using the Landsat-derived Relativized differenced Normalized Burn Ratio (RdNBR) for fires >40 ha since 1984. Forest structure was measured using airborne LiDAR data acquired in 2010 and 2011 across two study areas (9,525 and 16,698 ha). Both study areas included large areas outside of all fire perimeters that allowed comparison of unburned forest structure with areas that experienced a single fire since the early 1930s. Our study area included ponderosa pine, white fir-sugar pine, red fir, and lodgepole pine forests. We identified five classes of vertical structure and three arrangements of canopy patches and gaps associated with different combinations of forest type and absence of fire and different fire severities. As expected, increasing fire severity generally resulted first in loss of structure in lower height strata and increased number and size of gaps, then in loss of structure in higher height strata with a canopy gap structure, and eventually to open areas with few trees. However, the fire severities at which these transitions occurred differed for each forest type, suggesting that a single model of forest structure response to fire cannot be applied across multiple forest types. We were surprised to observe substantial structural differences associated even with lower severity fires and the longevity of structural changes with time since fire. Our work suggests that the fire severity needed to restore forests to conditions believed to be similar to those prior to Euro-American settlement differ by forest type.

Karau, Eva

Eva Karau is a biological scientist with the Fire Modeling Institute at the Forest Service Rocky Mountain Research Station, Fire Sciences Laboratory. She has B.S.in Geology from the University of Montana and an M.S. in Forestry from the University of Montana. Her work involves spatial analysis for a system that helps to inform hazardous fuels prioritization and allocation decisions on a national scale. Before joining FMI, Eva was an ecologist in the Fire Fuels and Smoke program, where she evaluated burn severity mapping techniques and used succession and disturbance simulation models to explore landscape ecology questions and assess the ecological benefits of wildfire.

Oral presentation, Wednesday, 2:30 PM, C125

Integration of satellite imagery with simulation modeling improves burn severity mapping

Both satellite imagery and spatial fire effects models are valuable tools for generating burn severity maps that are useful to fire scientists and resource managers. The purpose of this study was to map burn severity using an approach that integrated imagery and modeling to create more accurate burn severity maps; we developed and assessed a statistical model that combines the Relative differenced Normalized Burn Ratio (RdNBR), a satellite image-based change detection procedure commonly used to map burn severity, with output from the Fire Hazard and Risk Model (FIREHARM), a simulation model that estimates fire effects at a landscape scale. Using 289 Composite Burn Index (CBI) plots in Washington and Montana as ground reference, we found that the integrated model explained more variability in CBI ($R^2 = 0.50$) and had lower mean squared error (0.28) than image ($R^2 = 0.41$, MSE = 0.31) or simulation-based models ($R^2 = 0.07$, MSE = 0.51) alone, and

all model relationships were strongest when the data were stratified by state. Overall map accuracy was also highest for maps created with the Integrated model (61%), though user's accuracy for the high severity class was highest for the Rd-NBR model (75%). Though simulation model performance would improve with better availability of high quality, accurate spatial input data, the results of this study indicate that potential benefit of combining satellite image-based methods with a fire effects simulation model to create improved burn severity maps.

Kaye, Tom

Tom Kaye, Executive Director and Senior Ecologist at the Institute for Applied Ecology, is a plant ecologist committed to conserving habitats and native species in the Pacific Northwest. Tom has a PhD in plant ecology from Oregon State University and conducts research on many aspects of habitat management, endangered species conservation, and invasive species control.

Oral presentation, Wednesday, 4:40 PM, B115

Fire as a tool for managing prairie habitats and at-risk species

Prairies are in decline in the Pacific Northwest and face invasion and degradation by non-native vegetation, especially perennial grasses. Fire played an important role in the maintenance of these prairies historically and fire suppression in the last century has contributed to the decline of the ecosystem and the endangerment of several prairie-dependent species. We have conducted several experiments with fire for habitat management as well as to promote individual rare species. One experiment tested the effects of various habitat management treatments in combinations on prairie communities that were semi-degraded (native vegetation that was partially invaded by non-natives). Ten study sites were included in Oregon, Washington and British Columbia and the same experiment with five treatment combinations was implemented at each. We found that fire combined with carefully timed grass-specific (sethoxydim) and broad-spectrum (glyphosate) herbicide applications reduced the abundance of invasive plants, but seed addition was necessary to increase native plant diversity. In contrast, mowing, which is often used in these systems when fire is unavailable as a management option, had little to no effect compared to unmanipulated controls. Seed addition resulted in higher species diversity and abundance especially when conducted in the fall immediately following a burn. Our experimental burns to improve conditions for threatened and endangered prairie species in Oregon have shown that populations of Bradshaw's lomatium and Kincaid's lupine are improved by fires, and Fender's blue butterfly increases oviposition in burned plots. Prairies in this region are seed limited, and seeding to improve native plant diversity and abundance is most effective after a fire. In addition, fire as a management tool to control invasives is more effective when combined with other treatments such as herbicide. Fire is a crucial management tool for prairie habitats and at-risk species in this region.

Keane, Robert

Robert E. Keane is a Research Ecologist with the USDA Forest Service, Rocky Mountain Research Station at the Missoula Fire Sciences Laboratory (5775 West US Hwy 10 Missoula, MT 59808-9361, Phone: 406-329-4846, Email: rkeane@fs.fed.us). 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.

Oral presentation, Thursday, 2:30 PM, B112

Spatial scaling of wildland fuels for six forest and rangeland ecosystems of the northern Rocky Mountains, USA

Wildland fuels are important to fire managers because they can be manipulated to achieve management goals, such as restoring ecosystems, decreasing fire intensity, minimizing plant mortality, and reducing erosion. However, it is difficult to accurately measure, describe, and map wildland fuels because of the great variability of wildland fuelbed properties over space and time. Few have quantified the scale of this variability across space to understand its effect on fire spread, burning intensity, and ecological effects. This study investigated the spatial variability of loading (biomass) across major surface and canopy fuel components in low elevation northern Rocky Mountain forest and rangeland ecosystems to determine the inherent scale of surface fuel and canopy fuel distributions. Biomass loadings (kg m-2) were measured for seven surface fuel components -- four downed dead woody fuel size classes (0-6 mm, 6-25 mm, 25-75 mm, and 75+ mm), duff plus litter, shrub, and herb) using a spatially nested plot sampling design within a 1 km2 square sampling grid installed at six sites in the northern US Rocky Mountains. Bulk density, biomass, and cover of the forest canopy were also measured for each plot in the grid. Surface fuel loadings were estimated using a combination of photoload and destructive collection methods at many distances within the grid. We quantified spatial variability of fuel component loading using spatial variograms, and

found that each fuel component had its own inherent scale with fine fuels varying at scales of 1 to 5 m, coarse fuels at 10 to 150 m, and canopy fuels from 100 to 500 m. Using regression analyses, we computed a scaling factor of 4.6 m for fuel particle diameter (4.6 m increase in scale with each cm increase in particle diameter). Findings from this study can be used to design fuel sampling projects, classify fuelbeds, and map fuel characteristics, such as loading, to account for the inherent scale of fuel distributions to get more accurate fuel loading estimations.

Keane, Robert

(See biographical information, above.)

Oral presentation, Thursday, 11:25 AM, B110

Integration of ecological principles into land management - What has been done over the last decade and what still needs to be done?,

Need Abstract

Keane, Robert

(See biographical information, above.)

Oral presentation, Tuesday, 11:00 AM, B110

Simulating multiple disturbance-landscape interactions: Model processes, progress, and predictions

Changes in climate and human activities have caused important shifts in disturbance and vegetation dynamics, and most of these shifts have resulted as a consequence of unanticipated feedbacks and interactions. Understanding and forecasting possible future changes in landscapes of the western US will require that important feedbacks, interactions, and connections between ecosystem processes be addressed. We have developed a mechanistic ecosystem dynamics model FireBGCv2 to simulate effects of present and future climates and land management on disturbance and vegetation dynamics. This presentation will detail the FireBGCv2 model and discuss its strengths and limitations. The design, major algorithms, and simulated ecological processes will be discussed along with input and output requirements. Then the major strengths of mechanistic spatial modeling will be presented along with the major limitations of using complex modeling for climate change predictions. FireBGCv2 simulation results show that interactions among climate changes and disturbance processes impact vegetation species conversions and amplify fire dynamics. Vastly different results are simulated without explicit simulation of these interactions at multiple time and space scales,

Keane, Robert

(See biographical information, above.)

Oral presentation, Tuesday, 3:50 PM, B114

Wilderness and whitebark pine restoration: a barrier and an opportunity

Whitebark pine is a keystone species in upper subalpine forests of the northern Rocky Mountains, Cascades, and Sierra Nevada that has been declining because of recent mountain pine beetle and exotic blister rust epidemics, coupled with advancing succession resulting from fire exclusion. Whitebark pine is important to wilderness because many wildlife species depend on whitebark pine ecosystems for food and habitat, whitebark pine forests have high recreation value, and whitebark pine landscapes contain unique ecological processes. About half of the range of whitebark pine occurs in designated wilderness so the restoration of this foundation species is intimately tied with wilderness management. There are several issues facing whitebark pine restoration in wilderness that need to be addressed. The best wilderness restoration strategy is to encourage prescribed fires, especially allowing lightning fires to burn, with the subsequent planting of blister rust-resistant whitebark pine seedlings because many rust-infected whitebark pine stands are unable to produce enough seed to rely on natural regeneration. Several wilderness management policies may preclude this restoration strategy. This presentation discusses whitebark pine ecology and the importance of the species to wilderness, and presents restoration treatments and management alternatives for these remote settings. Then the presentation addresses the conflicts between wilderness management and whitebark pine restoration.

Keeley, Jon

Dr. Keeley is a research ecologist with the U.S. Geological Survey, stationed at Sequoia National Park in California and is an Adjunct Full Professor in the Department of Ecology and Evolutionary Biology at the University of California, Los Angeles. He has served in Washington, D.C. as director of the ecology program for the National Science Foundation and was professor of biology at Occidental College for 20 years. He has spent sabbatical leaves in all of the mediterranean climate regions of the world. Dr. Keeley has over 300 publications in national and international scientific journals and books. His research has focused on ecological impacts of wildfires as well as historical changes in fire regimes and their impact on invasive non-native plants. He has largely focused his work on mediterranean-type ecosystems including studies of plant life histories, the physiology of seed germination, taxonomy of Arctostaphylos (Ericaceae) and the biochemical pathways of photosynthesis in aquatic plants. In 1985 he was awarded a Guggenheim Fellowship and is a Fellow of the Southern California Academy of Sciences and an Honorary Lifetime Member of the California Botanical Society. He is senior author of a Cambridge University Press book "Fire in Mediterranean Climate Ecosystems: Ecology, Evolution and Management" with co-authors William Bond, Ross Bradstock, Juli Pausas and Philip Rundel, published in 2012.

Oral presentation, Tuesday, 11:00 AM, B118

Climate / Fire Relationships on Forested and Non-Forested Landscapes in California

Current understanding of fire / climate interactions largely stems from studies conducted in higher-elevation forested ecosystems on public lands in the western U.S. The results of these studies have encompassed broad swaths of landscape comprising diverse ecosystems, making it challenging to parse out temporal from spatial variation, or to tease out the influence of different fuel types and human impacts. Here we examine sub-regions within California and contrast climate/fire interactions in forested and non-forested landscapes over the 100 year period from 19:10 AM – 2010. Our study included two comprehensive data sets of all recorded fires on USFS national forests in California comprising nearly 25 million acres of mostly forested landscape and all recorded fires on CalFire state responsibility lands, comprising nearly 30 million acres of largely non-forested landscape. We analyzed spatial and temporal variation in burning relative to long-term climate and human demographic data, as well as biophysical variables such as vegetation type and topography. On both USFS and CalFire lands, the peak decade for area burned was the 1920s, with burned area declining in subsequent decades, not unlike the pattern observed throughout the West in other studies. Also similar to other studies, USFS lands showed a marked increase in burning beginning in the latter portion of the 20th century with a peak in the last 10 years comparable to the 1920s peak. However, largely non-forested CalFire lands presented a very different pattern as fire activity declined after the 1920s peak and it has not increased over the past 40 years. Annual climatic variation showed a weak relationship with area burned on two of the interior USFS regions but was unrelated to fire activity over the past century on most of the other USFS lands and none of the CalFire lands. Changes in human demography appears to play a significant role in fire activity on many of these lands, and climate / fire relationships affect fire differently in different regions, likely due to the mediating influence of other factors, such as fuel, terrain, and human demographics.

Keeley, Jon

(See biographical information, above.)

Oral presentation, Tuesday, 11:25 AM, B118

Understanding Massive Catastrophic Fires in Southern California

Massive high intensity wildfires are a natural part of the legacy of southern California landscapes. The largest such fire documented from detailed newspaper reports occurred in the late 1880s and burned over 300,000 acres but no homes were destroyed or lives lost. However, with the massive influx of humans into the region an average of over 500 homes have been lost from wildfires since 19:50 AM and the losses have accelerated in the past decade. Detailed studies of historical fires show that over the last 130 years there has been no significant change in the incidence of large fires greater than 10,000 ha, consistent with the conclusion that fire suppression activities are not the cause of these fire events. Eight megafires (>50,000 ha) are recorded for the region and half have occurred in the last 5 years. These burned through a mosaic of age classes which raises doubts that accumulation of old age classes explains these events. Extreme drought is a plausible explanation for this apparent rash of such events and it is hypothesized that drought leads to increased dead fine fuels that promote the incidence of firebrands and spot fires.

Kennedy, Patricia

Patricia (Pat) Kennedy, Professor of Wildlife Biology and Management, Oregon State University. My most recent contributions (with co-authors) to fire management have been to summarize the wildlife literature on effects of fire severity, fire surrogates, and time since fire in 3 publications: 1) an OSU Extension Bulletin (Kennedy & Fontaine 2009); 2) a recent BioScience paper (Stephens et al. 2012); and 3) an Ecological Applications paper (Fontaine & Kennedy 2012).

Oral presentation, Tuesday, 11:00 AM, B112

Meta-analysis of avian and small mammal response to fire severity and fire surrogate treatments in U. S. fire-prone forests

Management in fire-prone ecosystems relies widely upon application of prescribed fire and/or fire-surrogate treatments to maintain biodiversity and ecosystem function. Using meta-analysis, we examined the scientific literature on vertebrate demographic responses to burn severity (low/moderate, high), fire surrogates (forest thinning) and fire and fire surrogate combined treatments in the most extensively studied fire-prone, forested biome (forests of the United States). Effect sizes (magnitude of response) and their 95% confidence limits (response consistency) were estimated for each species by treatment combination with 2 or more observations. We found 41 studies of 119 bird and 17 small mammal species which examined short-term responses (< 4 yr) to thinning, low/moderate and high-severity fire, and thinning + prescribed fire; data on other taxa and at longer timescales were too sparse to permit quantitative assessment. At the stand scale (< 50 ha), thinning and low/moderate-severity fire demonstrated similar response patterns in these forests. Combined thinning + prescribed fire produced a higher proportion of positive responses. High-severity fire provoked stronger responses with a majority of species possessing higher or lower effect sizes relative to fires of lower severity. In the short term and at fine spatial scales, fire surrogate forest thinning treatments appear to effectively mimic low/moderate-severity fire whereas low/moderate-severity fire is not a substitute for high-severity fire. The varied response of taxa to each of the four conditions considered makes it clear that the full range of fire-based disturbances (or their surrogates) is necessary to maintain a full complement of vertebrate species, including fire sensitive taxa. This is especially true for high-severity fire where positive responses from many avian taxa suggest this disturbance (either as wildfire or prescribed fire) be included in management plans where it is consistent with historic fire regimes and maintenance of regional vertebrate biodiversity is a goal.

Kern, Christel

Christel C. Kern, Research Forester, USFS Northern Research Station. Leader in reviving U.S. Forest Service Experimental Forest research in western Great Lakes, such as prescribed fire study in red pine at the Cutfoot Experimental Forest, MN.

Oral presentation, Thursday, 4:15 PM, B115

Persistent legacies of long-past prescribed fire on woody vegetation of red pine (Pinus resinosa) ecosystems

Red pine forests of the western Great Lakes region are classic examples of fire-dependent ecosystems that have been affected adversely by decades of fire suppression. Historically, these forests supported frequent surface fires (every 5–50 years) and infrequent crown fires (15–250 years). Suppression of surface fire in particular has led to a dramatic increase in live fuels and also reduced establishment opportunities for pines. Therefore, prescribed fire is considered a vital tool to reduce fuels and prepare seedbeds for pine regeneration, while maintaining a productive overstory. However, little, if any, long-term studies on prescribed fire in red pine forests exist, so its utility at reducing the build-up of shrubs and sub-canopy trees and facilitating pine regeneration remains poorly understood. In 1959, the Red Pine Prescribed Burning Experiment was established in northern Minnesota to test the effects of prescribed fire on woody plant composition and structure. The study was designed to test six combinations of season (dormant, summer) and frequency (annual, biennial, periodic) of prescribed fire with no burning. The study was actively treated and measured between 1960 and 1970. Remeasurements of the study in 2005 show that annual summer burns have long-lasting impacts on woody shrub communities, with stem densities substantially lower in this treatment, compared to the others, even 40 years after the last fire. Moreover, several annual summer burns appear conducive to establishment of an eastern white pine (Pinus strobus) component under the red pine, if a seed source is present after the last fire. The other treatments were much less effective at reducing shrub densities or promoting white pine establishment. This study's 40-year fire-free period highlights that season and frequency are critical factors to designing prescribed fire regimes that create long-term, persistent effects on live fuels and tree regeneration in red pine and similar ecosystems.

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, where she first started working in southwestern

ponderosa pine forests. Becky has been conducting research the past 15 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.

Oral presentation, Thursday, 11:25 AM, B112

Effects of Prescribed Burn Regime and Grazing on Eastern Oregon Ponderosa Pine Vegetation and Fuels: The Season and Interval of Burn Study

In the western United States, the Season and Interval of Burn study represents a unique long-term permanent plot study platform that was developed on the Malheur National Forest in 1997 using six upland ponderosa pine forested stands. Established at the request of local land managers to investigate the influence of a single spring and fall prescribed fire treatment on black stain root disease and its potential insect vectors, the original study was significantly expanded in 2002 to include 5 and 15 year burn intervals, a grazing component and the addition of an array of ecosystem response variables— tree growth and mortality, interactions with insect and diseases, fuels, understory vegetation and exotic plant species, and soil organic matter and biota—all largely funded by JFSP and the National Fire Plan over the following decade. To date, all 5-year interval burns have proceeded exactly on schedule, and the first 15-year interval burn is scheduled for the fall of 2012 and spring of 2013. We have significantly improved our understanding of prescribed fire regimes in these forests and the interaction of cattle grazing. A field guide to predict delayed mortality of fire-damaged ponderosa pine was produced and the pine mortality model developed from this study was being validated in several other landscapes. Here we review and synthesize results that have been published on immediate and delayed tree mortality, understory vegetation and exotic plant species, black stain root disease, soil organic matter and biota, and soil chemistry. Data collected in 2012 – 2014 will provide a comprehensive comparison of two burn intervals (5 and 15 year) in northwestern ponderosa pine forests.

Kinkead, Carter

Carter Kinkead, Graduate Research Assistant, University of Missouri: Carter has studied woodland restoration extensively in the Ozark Highlands Region. He is the president of the Mizzou chapter of Student Association of Fire Ecology (S.A.F.E), and works with many agencies and organizations promoting prescribed burning in the area.

Oral presentation, Thursday, 1:40 PM, C120

Restoring Oak Woodlands: Vegetative Response to Thinning and Burning in the Ozark Highlands

Fire has long mediated the successional stages of many oak ecosystems in the North America. In the Ozark Highlands Region of the Midwest, fire-adapted flora and fauna remain abundant in several natural communities. However, since the beginning of the fire suppression era in the early 20th century, species compositions have gradually shifted to support different vegetation types. Generally, this has led to a reduction in biodiversity. As management agencies and landowners attempt to restore native species to these communities, increased focus is directed toward re-establishment of a fire regime to emulate historic disturbance conditions. This study evaluates the changes in structure, composition, and growth of overstory and understory vegetation in oak woodlands of Missouri due to the re-introduction of fire on the landscape. One year after the second prescribed fire, overstory stocking (stand density) had decreased 15%. Prescribed fire alone did not have a significant impact on radial growth of white oaks, causing only a marginal 1.4% decrease in growth rate, compared to a 1.9% decrease in control. Understory physiognomic groups including forbs, graminoids, legumes, shrubs, and vines all increased in coverage following prescribed burn treatments. Mechanical thinning treatments were also evaluated as means of achieving restoration objectives, but showed potential for adverse effects given the response of woody species in the understory (stump sprouts). Overall, prescribed fire alone may pose a sustainable option for oak woodland restoration, where overstory stocking is decreased over time thereby subtly achieving canopy openness and suppression of woody regeneration.

Kitchen, Stanley

Dr Kitchen is a Research Botanist for the USDA Forest Service, Rocky Mountain Research Station. His research focuses on the drivers of fire regime variability and consequences of fire regime change in forest, woodland and shrubland ecosystems of the Great Basin and Colorado Plateau of western North America.

Oral presentation, Thursday, 1:15 PM, B113

Climate and Human Influences on Historical Fires (1400-1900) in the Eastern Great Basin (USA)

High fire activity in western North America is associated with drought, which is influenced by Pacific Ocean surface temperature variability and associated atmospheric circulation patterns. Drought prevails under negative El Niño Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO) phases in the Southwest and under positive phases in the Northwest. Fire seasonality patterns also differ geographically. My objectives were to investigate the historic fire-climate relationship in the eastern Great Basin, a region transitional between the Southwest and Northwest, and to seek evidence of human influence on fire occurrence. Using tree-ring evidence, multi-century surface fire chronologies were constructed for 10 sites on six mountain ranges. I identified 67 regional and 247 local fire years between 1400 and 1900 C.E. Fire years were analyzed in relation to variability in the Palmer Drought Severity Index, ENSO, and PDO. Regionally, fires were significantly more common in dry years. Conditions were significantly wetter 2 years prior to regional fire years and drier during 4 years prior to no-fire years, providing evidence that fire was historically fuel-limited. Regional fire years were associated with negative ENSO and positive-to-negative PDO transitions while no-fire years were associated with positive ENSO and negative-to-positive PDO transitions. Local fire years occurred under a range of conditions. Results indicate that the climate-fire response for this region was allied with the southwest mode over this 500-year period. Across sites, inferred fire seasonality was bimodal with both early- and late-season fires more numerous than mid-season fires. This pattern is distinct from that observed for modern, lightning-caused fires which peak in mid-season, suggesting a human influence on historical ignitions. It appears that climate was an important synchronizer of fire regionally and that locally, fire regimes were the product of climate-regulated fuels and a combination of human and lightning ignitions that varied through time and space.

Knapp, Eric

Eric E Knapp. Research Ecologist, US Forest Service, Pacific Southwest Research Station. I have published papers on topics including fire effects to plants, prescribed fire, fuel management, and remotely sensed fire severity. I am more comfortable having others gauge which achievements are "notable".

Oral presentation, Thursday, 3:25 PM, C120

Variable intensity salvage logging after fire: effects on natural regeneration, non-native species, and understory diversity

After the 2002 Cone Fire in the southern Cascades of northern California, an experiment was established to investigate the impact of varying levels of fire salvage on subsequent vegetation and fuel dynamics. Two hectare plots within stands at the Blacks Mountain Experimental Forest that experienced stand-replacing fire were randomly assigned one of five salvage treatments (100%, 75%, 50%, 25% by basal area, and unsalvaged). Salvage was done as a "thinning from below" retaining the largest snags. Each treatment was replicated three times. In the summer of 2006, 2008, and 2010, understory vegetation was surveyed within two 1m2 quadrats at thirteen grid points per unit, and abundance of each herb and shrub species was estimated by cover category. In addition, numbers of natural tree seedlings were counted by species. If the disturbance of salvage logging influenced understory and tree seedling abundance, a gradient related to salvage intensity would have been expected. While the cover of non-native species increased from 0.7% in 2006 to 2.6% in 2010, there was no significant effect of the salvage logging treatments. Similarly, native species richness did not differ among treatments in any year. Presence of both native and non-native species was apparently affected more strongly by the disturbance caused by fire than by salvage logging. Natural tree regeneration was very low, with fewer than 20 seedlings ha-1 in all but three of the units. No significant differences among treatments were found. Rate of natural regeneration appeared to be due primarily to the proximity to surviving trees (seed source), rather than salvage activity.

Kobziar, Leda

Leda N. Kobziar, Associate Professor of Fire Science and Forest Conservation. PI of the Southern Fire Exchange, a JFSP regional consortium connecting fire science with fire management in the southeastern US., Oral presentation

Thursday, 2:05 PM, C120

The legacy of 23 years of mechanical fuels treatments and prescribed fire on vegetation in Florida

Florida is a unique bio-geographical region in that it harbors some of the most biologically diverse ecosystems in North America, many of which are also highly flammable with numerous fire dependent species. Among these fire-adapted ecosystems are flatwoods, which cover the largest overall area across the southern Coastal Plain. Flatwoods have suffered substantially from fire suppression, fragmentation, and alteration of their natural hydrology, with increases in density and height of shrubs, litter and duff accumulation, and a concomitant decrease in density and richness of graminoid and her-

baceous species. In the flatwoods prairies of Myakka River State Park in central Florida, an experiment was established in 1988 to compare the effectiveness of treatment type and season of application for restoring native understory composition and structure. The effects of six treatments including mechanical fuels reduction, prescribed burning, and the combination thereof across growing and dormant seasons were evaluated 23 years after treatments began. Non-metric multidimensional scaling (NMDS), indicator species analysis, and species accumulation curves were used to assess vegetation change over time. When compared with reference sites, representing the desired future condition, mechanically treated sites differed most drastically, even after maintenance burning had been initiated after the first decade of treatments. Season of treatment was not found to explain variability in species richness, composition, or cover. Combinations of mechanical and burning treatments were mostly indistinguishable from burning treatments alone. Overall, treatments including fire proved most similar to reference conditions, regardless of season.

Koch, Jennifer

Jennifer Koch is a research associate with Oregon State University and the Biological and Ecological Engineering Department. She is currently working on a National Science Foundation grant funded project with the USDA Forest Service, Pacific Northwest Research Station and Oregon State University called Forest, People, Fire. Her role in this project is to assist in the development of ENVISION, a model integration platform combining biophysical, social, and economic models of landscape change.

Oral presentation, Wednesday, 3:25 PM, B113

Developing an agent-based modeling approach to simulate the dynamics in fire-prone landscapes

Wildfire risk management in the fire-prone landscapes of Central Oregon follows two different approaches. On one hand, the fire protection approach considers wildland fire as a threat to human values (e.g. houses), which has to be mitigated or extinguished. On the other hand, the forest restoration approach considers wildland fire as an important process for sustaining biodiversity and resilient forest ecosystems. A lack of coordination between actions following the different approaches can result in policies that are suboptimal or even maladaptive (e.g. increased risk of high severity fire caused by fire suppression). We address these issues, and potential tradeoffs between them, by applying a whole-landscape approach. We describe the fire-prone landscapes of Central Oregon as a coupled human-natural system and use an integrated agent-based modeling framework to explore the complex dynamics in this system. Following the whole-landscape approach, the framework includes representations for development, vegetation succession, occurrence and severity of wildland fire, as well as human decision making with regard to wildfire risk management. The goals of this modeling exercise are (1) to advance the understanding of complexities and feedbacks in the fire-prone landscapes of Central Oregon, (2) to advance the understanding of the adaptation of humans to living in fire-prone landscapes, and (3) learn how wildland fire policies could be made more effective.   In this paper, we focus on a description of the agent-based modeling framework and on a presentation of initial simulation result of a sensitivity analysis of the modeling system. We furthermore present the effect of various policy settings on the habitat of key species of Central Oregon (Northern Spotted Owl (Strix occidentalis caurina), Mule Deer (Odocoileus hemionus), White-headed Woodpecker (Picoides albolavartus)), each of which represents a different set of environmental conditions.

Kocher, Susan

Susie Kocher is an extension forester for the University of California Cooperative Extension in South Lake Tahoe, California. She has conducted outreach, education and applied research in forestry, wildfire, and water quality in the Sierra Nevada for 16 years. She works to improve connections between forest scientists and managers and is a founder of the California Fire Science Consortium. She is also a California Registered Professional Forester.

Oral presentation, Thursday, 3:50 PM, B112

Restoring Forest Lands Following the 2007 Angora Fire at Lake Tahoe, in the Sierra Nevada, California

The 2007 Angora fire burned 250 homes and 3,100 forested acres in the community of South Lake Tahoe, California including 90 acres owned by the California Tahoe Conservancy, an independent State agency established to implement environmental projects, protect wildlands, and protect water quality in Lake Tahoe.   About 40 acres of Conservancy lands burned at high severity, with 100% of trees killed. Conservancy goals were to re-establish a native forest, reduce hazards posed by dead trees and avoid water quality impacts. An "active" restoration approach was used involving removal of dead trees and replanting. Large dead trees were cut and skidded to a landing where they were processed, loaded on log trucks, and sent to a nearby mill. Small trees were masticated and left on site to control erosion and suppress competing vegeta-

tion. After mastication was completed, one to two year-old tree seedlings were planted. Monitoring using a before-after-control-impact (BACI) showed this "active" approach was effective at re-establishing a native forest while minimizing water quality impacts and fire risk. Planted seedlings are growing quickly while in the adjacent untreated area, the few naturally sprouting tree seedlings are unlikely to thrive due to competition from vigorously growing brush. We estimate treatment will expedite the return to a forested condition in the area by 60 years. Tree removal using heavy equipment did not compact the soil. Erosion control measures were effective, although the mild winter experienced immediately after the fire was critical in reducing soil erosion risk. The woody mulch left on site was effective at suppressing brush however, it forms a layer of surface fuel that carries some fire risk. The relative fire risk posed by the woody mulch as compared to the risk from rapidly growing brush and falling dead trees on the untreated site is difficult to assess.

Kocher, Susan

Susie Kocher is a natural resources advisor and registered professional forester for the University of California Cooperative Extension in the Central Sierra Nevada. She coordinated needs assessment work for the California Fire Science Consortium, is active with the Sierra Nevada and WUI module, and is the CFSC evaluator. She also collaborates with the University of Nevada Cooperative Extension to organize Wildfire Awareness Week and an annual wildfire summit in the Lake Tahoe basin. She is doing applied research on the effects of different reforestation strategies taken after the 2007 Angora Fire in South Lake Tahoe.

Oral presentation, Tuesday, 1:15 PM, B111

Wildland Fire Science and Management in the U.S.: Spanning the Boundaries through the Regional Knowledge Exchange

In 2009, the federal Joint Fire Science Program (JFSP) initiated a national network of regional fire science consortia to accelerate awareness, understanding, and use of wildland fire science. This presentation synthesizes findings from needs assessments conducted by consortia in eight regions of the United States. The assessments evaluated how fire science is accessed and used in each region, barriers to its use, types of information needed, and potential roles for the new consortia through in-person interviews, focus groups and on-line surveys of federal, state, and local fire science users and producers. Despite differences in assessment methods, ecosystems, geography, and demography, striking similarities were found. Needs assessment results found a clearly expressed need for boundary spanning across fire science and management. Key features of successful boundary organizations are information salience, credibility and legitimacy. The information generated must be scientifically credible and carry a degree of legitimacy within the social worlds of both scientists and managers. The success of boundary organizations hinges on understanding the decision context and stakeholder perspective, developing strong stakeholder relationships, and providing information that is accurate, credible and presented at relevant spatial and temporal scales. Findings showed that though use of and regard for Internet-based fire science information is universally high, in-person knowledge exchange is preferred. Obstacles to fire science application include lack of time, resources, and access to the most relevant information as well as communication barriers between scientists and managers. Priority science topics identified across regions include fire effects, fuels and modeling, and best practices for prescribed burns. This synthesis suggests that consortia focus on a) organizing and consolidating fire science through easily accessible websites and b) strengthening relationships between scientists and managers to facilitate production, communication, and adoption of science is relevant to managers' concerns.

Kocher, Susan

Susie Kocher is a natural resources advisor for the University of California Cooperative Extension. She coordinates public outreach for the Sierra Nevada Adaptive Management Project (http://snamp.cnr.berkeley.edu/) including over 4,500 in person contacts with participants over the last five years in the form of science meetings, field trips, presentations and workshops as well as development of a website, research briefs, videos, discussion boards, and social media. She collaborates with the University of Nevada Cooperative Extension to offer the Living with Fire in the Tahoe Basin program (www.livingwithfire.info/tahoe) which includes organizing an annual Wildfire Awareness Week and wildfire summit in the Lake Tahoe basin in South Lake Tahoe.

Oral presentation, Tuesday, 2:30 PM, B111

Best practices for communicating with the public about fire science and management, Improving communication with the public about fire science and management is widely believed to be an important pre-requisite for gaining public acceptance and support for fire policy and management. Fire management agencies, therefore, often launch outreach efforts to better communicate about their programs to the public. To enhance the effectiveness of these efforts, fire managers seek guidance

from each other and from the research community on how best to communicate with the public, both before and during fire incidents.   Pitfalls that interfere with successful outreach include unrealistic goals, lack of training, lack of internal communication, and inadequate funding and staffing. Smaller organizations typically allocate some time to resource staff to conduct outreach, but rarely provide training in outreach techniques or best practices. Larger organizations often employ a trained public information officer, who can help resource and technical staff deliver technical and procedural messages to the public.   This talk will focus on best practices for communicating the fire message to the public including identifying your audience; setting realistic goals and developing a process to measure whether you are reaching them; organizing, hosting and following up on in person events; setting up at-a-distance methods of communication such as websites, media releases, and working with public information officers. We will also address the need to coordinate the outreach message with other partner agencies to reduce confusion among the audience.   Well conducted outreach can increase awareness, understanding and input about fire and fire management, increase interactions among stakeholders, and increase public participation. This requires using a variety of outreach methods and thinking 'outside the box'. Outcomes of successful outreach will include engaged participants that value mutual learning between all stakeholders, project transparency and credibility, and reduced conflict and higher trust through improved relationships.

Kolden, Crystal

Crystal Kolden is an assistant professor of geography and Certified Fire Ecologist. She leads the Pyrogeography Lab at the University of Idaho.

Oral presentation, Wednesday, 11:00 AM, B116

Fuel treatment effectiveness in a changing climate: a case study from Southern California

Fuel treatments are generally designed to effectively reduce fire behavior under extreme conditions as determined by the historic range of variability. For example, the Charlton-Chilao fuel treatment successfully reduced fire behavior during 97th percentile conditions on the 2009 Station Fire in California to a level where ground resources could safely and effectively implement fire suppression. However, the projected changes in climate conditions and increased wildfire activity in the western U.S. over the coming decades raise questions about future fuels treatment effectiveness under record conditions which will likely exceed the historic range. We used downscaled IPCC future climate scenarios to model fire behavior under both historic and future (mid-21st century) 90th and 97th percentile mid-summer conditions scenarios in order to assess the effectiveness of the Charlton-Chilao and five other fuel treatments in the Los Padres, Angeles, and San Bernardino National Forests in California. We chose mid-summer to acknowledge that fuel treatments are largely ineffective during autumn Santa Ana wind-driven wildfires, and that they are far more effective during the fuel and topography-driven summer wildfire season in southern California. We found that while all fuel treatments would still reduce fire behavior to some extent under future climate scenarios, they would not achieve reduction objectives, and more intense treatments will be necessary to meeting treatment objectives for firefighter and public safety during implementation of suppression. Given the projected changes in climatic conditions, fuel treatment designs must embrace future climate conditions and incorporate a maintenance cycle to remain in an effective state.

Kolden, Crystal

(See biographical information, above.)

Oral presentation, Tuesday, 2:30 PM, C125

Mapped versus actual area burned within wildfire perimeters: characterizing the unburned

For decades, wildfire studies have utilized fire occurrence and area burned as the primary data sources for investigating the causes and effects of wildfire on the landscape. Fire occurrence data fall primarily into two categories: ignition points and perimeter polygons that assume a homogenous burned area across a fire, even though it is widely acknowledged that fires burn heterogeneously. This research characterizes unburned areas within the fire footprint. We utilized differenced Normalized Burn Ratio (dNBR) data from the Monitoring Trends in Burn Severity project to look at patterns of unburned area in three national parks across the western US (Glacier, Yosemite, and Yukon-Charley Rivers) and characterize unburned area within fire perimeters by fire size and severity, distance to an unburned area across the burned portion of the fire, and patch dynamics of unburned patches within the fire perimeter. From 1984 through 2009, the total area within the fire perimeters that was classified as unburned from dNBR was 37 percent for Yosemite, 17 percent for Glacier, and 14 percent for Yukon-Charley Rivers, with the greatest range of proportion unburned in Yosemite, and the lowest range in Yukon-Charley. Unburned proportion significantly decreased with increasing fire size and severity across all three parks.

Unburned patch size increased with size of fire perimeter, but patches decreased in density. There were no temporal trends in unburned area found. These results raise questions about the validity of relationships found between external forcing agents, such as climate, and 'burned area' values derived solely from polygon fire perimeters.

Kooistra, Chad

Chad Kooistra earned his B.S. in Natural Resource Recreation and Tourism from Colorado State University in 2005, and his M.S. in Natural Resources from the Conservation Social Sciences (CSS) Department at the University of Idaho in 2011. Currently working towards his PhD in the CSS Department, his research is part of an interdisciplinary NASA sponsored project aimed at better understanding the socio-ecological characteristics of 'extreme' wildfires and what it means for fostering more resilient social and natural communities. His first publication was with Dr. Gary Machlis in the Journal of the Office of Strategic Services (OSS) Society writing about how applying science during crises can be inspired by the work of the OSS intelligence agency during WWII.

Oral presentation, Tuesday, 4:15 PM, B115

Understanding Residents' Concerns and Support for Forest Management and Economic Development Options on Public Lands after Mountain Pine Beetle Outbreaks, in Grand County, Colorado

Discussions with community leaders in Grand County, Colorado, revealed a need to document and understand residents' concerns about the impact of recent widespread mountain pine beetle outbreaks and their levels of support for various forest management and economic development options to help minimize impacts from the outbreak. We investigated the relationships between environmental concern, risk perceptions, and support for forest management options in Grand County, Colorado, using a mixed methods study design. A mail survey of permanent residents (n=234 completed surveys; 57% response rate) was conducted in 2010. Risk perceptions (concerns) were measured on a 7-point Likert scale and were found to be mostly moderate, except towards wildfire and blowdowns, which were relatively high. Support for forest management on public land and economic development options was measured, along with factors expected to explain support (risk perceptions, trust/confidence in management, and levels of participation in public involvement). Support for all forest management and economic development options was relatively high. Regression analysis revealed that risk perceptions, gender, political orientation, and public involvement were significant predictors of various management options- although explained variance (R2) was less than .23 for each option construct. Satisfaction with and confidence in land managers and community leaders was fairly low. Environmental worldview (NEP) was a significant predictor of ecological risk perceptions, but not social risk perceptions nor support for management options. To help interpret and explain these findings, semi-structured telephone interviews were conducted with 36 respondents. Analysis revealed that concerns over wildfire and impacts to the community due to decreased aesthetic qualities have more influence than environmental concern on support for active management. Analysis also illustrated the complexity of this issue by revealing tradeoffs that occur among permanent residents' attitudes and considerations of competing risk perceptions, perceived benefits of forest management, and levels of environmental concern.

Kramer, Anu

Anu Kramer is a 3rd year Ph.D. student at U.C. Berkeley in the department of Environmental Science, Policy, and Management, working with Scott Stephens. Her research focuses on ways in which LiDAR can account for ladder and canopy fuels and how this can contribute to fire modeling.

Oral presentation, Thursday, 2:30 PM, C121

What LiDAR metrics are most important for explaining the occurrence of severe wildfire?

Crown fire is difficult to control and is dangerous for fire suppression crews and residents in the wildland urban interface. Current wildfire modeling programs are empirically based, and underpredict crown fire behavior and effects, making crown fires even more hazardous. These models require a number of inputs with varying degrees of uncertainty associated with each input. With ever-increasing coverage of aerial LiDAR (Light detection and ranging), a number of studies have explored the potential for LiDAR to predict these model inputs. While aerial LiDAR has proven useful for predicting canopy characteristics, it predicts surface fuels and fuel models poorly. Even if LiDAR could predict all inputs, the models themselves may still underpredict crown fire. This study explores an alternate approach to the problem. We test the ability of aerial LiDAR to directly predict burn severity in the 2009 Silver Fire in the Northern Sierra Nevada. This fire burned at predominantly high severity, and provides a unique opportunity to directly test the abilities of LiDAR-derived metrics to predict fire effects. We hope this study will augment knowledge about how LiDAR can improve fire models.

Krasnow, Kevin

Kevin is an ecologist and educator passionate about understanding how to live sustainably with the natural world. He has conducted research in the Sierra Nevada and Rocky Mountains focusing on aspen ecology and restoration, fire history/ecology, and fuels mapping and fire simulation. He has instructed Outward Bound courses in the Beartooth Mountains of Montana, taught high school biology and chemistry, and directed an outdoor leadership and science program in San Francisco public schools. Kevin was recently honored with a Teaching Effectiveness Award at UC Berkeley for his work integrating his own fire history research in undergraduate education.

Oral presentation, Thursday, 2:30 PM, B114

Spatial and Temporal components of Historical Fire Regimes in Sierran Mixed Conifer Forests, California

Fire is a key ecological process in dry mixed-conifer forests that historically burned frequently. Many of these forests on the western slope of the Sierra Nevada have been highly altered by a century of fire suppression, mining, logging, and land-use change, which have homogenized forest structure over large areas. Historical spatial and temporal patterns of fire can be used to inform current and future disturbance-based management seeking to restore ecosystem heterogeneity and resilience that had been supported by frequent low to moderate-severity fires prior to the twentieth century. Temporal patterns of historical fire are well known in these forests, but there is a high degree of uncertainty regarding the spatial dynamics of the pre-settlement fire regime. In this study, the spatial and temporal dynamics of fire are reconstructed in a 3000 ha mixed-conifer forest in the southern Sierra Nevada using data from 118 fire scared tree samples. Thin plate spline interpolation is introduced as an alternative to inverse distance weighting methods for reconstructing spatial fire dynamics in forests that once burned frequently, and potential bias introduced by the common practice of preferentially sampling the most-scarred trees is explored.   Fire was once common in these forests that have not burned for 80-100 years, with mean fire return intervals from both spatially explicit and non-spatial temporal reconstructions ranging from 3-11 years. A vast majority of fires in this area (97%) occurred late in the growing season or during tree dormancy, and no significant controls on fire frequency were identified by slope aspect. Spatially explicit fire frequency reconstructions can aid in landscape-scale disturbance-based management aimed at increasing forest heterogeneity and reducing fire risk.

Kreitler, Jason

Jason Kreitler is a research geographer with the Western Geographic Science Center. His research program includes projects addressing wildland fire, climate change, landscape connectivity, and renewable energy development effects; in all of these research threads he seeks to find efficient and cost-effective solutions to resource constrained environmental problems, using landscape ecology, conservation planning, economics, and geospatial modeling and analysis techniques.

Oral presentation, Thursday, 1:15 PM, B117

Fire Adapted Communities

The goal of the Fire Adapted Communities element of the Cohesive Strategy is for human populations and infrastructure to be able to withstand a wildfire without loss of life and property. In this talk I will present a national map of county level participation in programs and activities that move communities in the direction of becoming more fire adapted, including the national Firewise, Ready Set Go!, and Fire Learning Network programs, and the implementation of county and local level community wildfire protection plans (CWPPs) and state/county/local building codes. This effort represents the first national view of fire adapted community program participation and activities, and is a preliminary step in determining what future actions could help communities address their wildland fire threats. Using exploratory spatial data analysis I will share an analysis of the heterogeneity in program participation, and determine how participation is a function of social, economic, and demographic variables or the level of risk a community faces. This data will then be used to illustrate where program support could assist communities in need, and where program participation is already established. This will help answer the larger question of how additional efforts could be allocated to assist communities that lack the capacity or capability to effectively mitigate their wildland fire risk, as well as understanding the characteristics of communities that have made progress in becoming fire adapted.

Kreye, Jesse

Jesse Kreye is a Postdoctoral Research Associate in the College of Forest Resources at Mississippi State University. He recently received his Ph.D. from the School of Forest Resources and Conservation at the University of Florida.

Oral presentation, Wednesday, 3:50 PM, B116

Ecological effects of mechanical mastication in pine flatwoods ecosystems of Florida, USA

Mechanical mastication of understory fuels is being widely conducted in fire prone ecosystems where fuel loading poses a hazard, yet little research examining ecological effects exists, especially in the southeastern US. In order to broaden our understanding of these treatments, effects of mechanical mastication ("mowing") were examined in a common pine ecosystem of the southeastern US Coastal Plain, where the post-mastication fuel environment is unique among ecosystems where mastication is being employed. Foliar litter dominates surface fuels after understory mastication in palmetto/gallberry pine flatwoods, however shrub recovery is quite rapid. Overstory tree mortality was observed following summer burning in these treatments and may have resulted from combustion of the compact surface fuels beneath the shrub layer. Although temperature and humidity at the shrub level were little influenced by treatments, drier surface fuels existed in masticated sites where shrub cover was reduced, potentially exacerbating combustibility of the surface fuel layer. Although understory trees were removed, treatments in the shrub-dominated understory had little impact on species composition or soil nutrients, however reduction in saw palmetto evidenced in this study may alter future groundcover vegetation as slight increases in grass cover were observed here. The fast recovery of understory vegetation and generally low impact to ecosystem attributes suggest a resiliency of these pine flatwoods to mechanical treatments, however long term effects are still unknown.

Kurth, Laurie

Laurie L. Kurth, Applied Fire Ecologist, USDA Forest Service. Laurie has been a Long Term Analyst (LTAN) conducting landscape scale fire analyses since 1996. She is the Co-Chair of the S495, Geospatial Fire Analysis, Interpretation, and Application steering committee responsible for developing training material with the latest developments in large scale analyses.

Oral presentation, Thursday, 3:50 PM, B110

Training in the Latest Developments in Remote Sensing, Geographic Information Systems, Information Management, and Communications Technologies

Recommendation 7 from the conference and workshop 'Crossing the Millennium: Integrating Spatial Technologies and Ecological Principles for a New Age in Fire Management' is:' … a new emphasis on training that incorporates the latest developments in remote sensing, geographic information systems, information management, and communications technologies' (Gollberg et.al., 2001). The National Wildfire Coordinating Group (NWCG) is the primaryorganization developing, sponsoring and providing training to the interagency wildland fire community to support wildland fire management, including fuels, fire ecology, and incident management. The wildland fire environment has increased in complexity due to ecological changes resulting from climatic variations, fuel accumulations, and non-native species invasion, as well as demographic shifts with increasing private development near or adjacent to public lands. Over the last decade new developments in wildland fire research, technology and data accessibility are now available to assist managers in broad scale assessments of fire ecology and fire risk to natural, cultural, and private values. Concurrently, information technology and education delivery systems have significantly changed providing substantial opportunities to develop and deliver training and technology transfer to vast audiences in a variety of methods suited to individuals' needs. The National Interagency Fuels Technology Transfer (NIFTT) coordinates development of software synthesizing new research and gives input into the development of NWCG online and classroom training focusing on fuels and fire planning. Other courses, such as Geospatial Fire Analysis, Interpretation, and Application (S-495) teach the foundations of geospatial modeling with incident management examples. Additional technology transfer is sponsored outside of NWCG through federal research stations and centers and universities. Training and technology transfer incorporating geospatial data and new information technologies has expanded over the last decade, however, there continue to be future opportunities. This paper will highlight advances during the last ten years and provide recommendations for the future.

Lake, Frank

Frank K. Lake works as a research ecologist for US Forest Service-Pacific Southwest Research Station, Fire and Fuels Program, on tribal and community forestry and related natural resource issues. He works with universities, fire safe councils, American Indian tribes and tribal basketweaver organizations on fire and fuels management issues. Frank serves as USFS resource advisor working with tribes on wildfires for the protection of Natural and Cultural Resources related to heritage and tribal values. He serves as a faculty member for the National Advanced Fire and Resource Institute (NAFRI) for the Rx 510 Advanced Fire Effects, and S-482 Advanced Fire Management Applications courses.

Oral presentation, Thursday, 3:25 PM, B116

Cultural burning practices and traditional ecological knowledge: implications for contemporary fuels and fire management

Many indigenous and tribal cultures adapted to fire modified habitats associated with various fire regimes. Additionally, these tribal communities used fire in different ways as a land management tool to maintain and enhance valued resources. Tribal traditional ecological knowledge of fire effects, short- and long-term on valued resources, guided cultural burning practices. Information from historical tribal burning strategies can be useful for contemporary fuels and fire management. The incorporation of tribal traditional ecological knowledge can foster collaborative education and management between tribes, agencies and non-governmental organizations. Ecological workforce training includes education of cultural and ecologically important habitats and vegetation beyond considering these as just "hazardous fuels." Incorporating tribal traditional ecological knowledge into hazardous fuels reduction and prescribe burning treatment planning efforts, along with implementation, and post-treatment effectiveness monitoring, provides a participatory approach for evaluating accomplishments and identifying needs for adaptive management. Examples will be used to provide context and suggested approaches for managers.

Lake, Frank

(See biographical information, above.)

Oral presentation, Tuesday, 1:15 PM, B118

Incorporating Indigenous community values for Natural and Cultural Resources into research and wildland fire management-A Western North American perspective

Many indigenous people of various tribes in Western North America rely on fire modified environments to perpetuate their cultures. Fire regimes associated with different vegetation-fuel types can influence the production of traditional foods, materials, medicines, and spiritual use qualities of an area or site. Wildland fire research and management activities can directly affect Indigenous community values pertaining to Natural and Cultural Resources. This presentation will share a "lessons learned" perspective of various wildland fire research projects and management case studies where the values of American Indian tribes were incorporated. Examples of working with academic and agency researchers, American Indian tribes, tribal and community-based organizations will be provided. Socio-cultural and ecological approaches examining local scale-fire effects on habitat cultural use quality to the landscape scale-fire regimes and indigenous community adaptive practices will be discussed. This presentation will include: aspects of working with tribal Traditional Ecological Knowledge; agency-tribal fire management and research agreements; Wildland fire planning efforts; and approaches for Climate Change adaptive strategies.

Larson, Andrew

Andrew J. Larson, Assistant Professor of Forest Ecology, Department of Forest Management, The University of Montana. Dr. Larson's research is focused on disturbances and structural development of natural forests, and development of silvicultural techniques to meet forest restoration objectives. He recently authored a comprehensive review of within-stand spatial patterns in fire-frequent forests of western North America, including mechanisms of pattern formation and implications for fuel reduction and forest restoration treatments.

Oral presentation, Tuesday, 2:05 PM, B114

Latent resilience: resumed frequent fire in the Bob Marshall Wilderness

The South Fork Flathead River valley in the Bob Marshall Wilderness Complex (BMWC) hosts relict ponderosa pine forests that were once maintained by frequent, low-severity fires. The US Forest Service excluded fire from these forests beginning early in the 20th century and by 1960 this policy had already transformed the historically open ponderosa pine forests into dense mixed-conifer stands due to encroachment by lodgepole pine and Douglas-fir. In recent decades, managers have begun to restore the keystone ecological process of fire to some large wilderness areas by permitting lightening-ignited fires to burn with little or no suppression. Reintroduction of fire to ponderosa pine forests of the S.F. Flathead valley was accompanied by concern that the heavy fuel loads that accumulated during the suppression era could lead to severe fire effects and loss of the large diameter ponderosa pine trees that define this forest type. I evaluated this concern, and the alternative proposition that repeat lightening-ignited fires can restore fire-excluded ponderosa pine forests, with measurements of forest structure and composition, tree mortality, and surface fuel loads in an area of ponderosa pine forest in the S.F. Flathead valley that burned in unsuppressed, lightening-ignited fires in 2003 and again in 2011. The 2011 fire resulted in mortality of many Douglas-fir and lodgepole pine trees that survived the 2003 fire. In contrast, the 2011 fire resulted in very low levels of injury and mortality of ponderosa pine. The 2011 fire also dramatically reduced the dense lodgepole pine

regeneration that established following the 2003 fire, altering the successional trajectory of this forest. These observations from the BMWC demonstrate that simply not suppressing lightening-ignited fires can be a viable strategy for restoration of fire-excluded ponderosa pine forests, and also suggest that fire-excluded forests may be more resilient to reintroduction of fire than is often assumed.

Lee, Danny

Dr. Danny C. Lee is the inaugural Director of the U.S. Forest Service's Eastern Forest Environmental Threat Assessment Center (EFETAC), established in early 2005 to develop knowledge and tools needed to predict, detect, and assess environmental threats to forests in the eastern United States. The Center is headquartered with the Southern Research Station in Asheville and has offices in Raleigh and Research Triangle Park, NC. Dr. Lee's individual research has focused on the application of systems analysis, risk assessment, and modeling of large-scale ecosystem management issues. Previous positions included project leader with the Pacific Southwest Research Station in Arcata, California, and science team leader for the Sierra Nevada Framework for Conservation and Collaboration from 1998-2000.

Oral presentation, Thursday, 2:05 PM, B117

Integration and analysis of tradeoffs and risks within the Cohesive Strategy

Wildland fire in the United States is a complex issue that involves myriad interactions among human communities and the biophysical and ecological systems in which they exist. A structured planning process that clarifies objectives and predicts possible outcomes to multiple values at risk is being used within the Cohesive Strategy to enhance collaboration and promote integration. Managers and stakeholders have teamed with scientists and analysts to explore a range of available options for creating resilient landscapes, promoting fire-adapted communities, and ensuring safe and effective response to wildfires. Analyses have involved assembling national datasets and implementing sophisticated and transparent approaches to modeling and analysis. Bayesian belief networks have proven to be especially useful tools for examining relationships and interactions among sectors and relating management actions to those factors and values which ultimately determine risk. This presentation will highlight some of the results from analyses than span socioeconomic, physical, and ecological considerations.

Lee, Danny

(See biographical information, above.)

Oral presentation, Tuesday, 3:50 PM, C121

Comparative risk assessment and its application to the Cohesive Strategy

The National Cohesive Wildland Fire Management Strategy (Cohesive Strategy) describes one of its core principles as "sound risk management is the foundation for all management activities." To this end, the Cohesive Strategy adopted a planning framework known as CRAFT (Comparative Risk Assessment Framework and Tools) to help steer development and analysis of alternative strategies for reducing risk from wildfire and enhancing ecosystem resiliency across the United States. These strategies are intended to be inclusive of all lands and provide general direction to federal, state, tribal, and local governmental and non-governmental entities involved in wildland fire management. CRAFT has proven to be an effective tool for identifying values at risk and structuring the development and discussion of alternatives among the various planning teams and interested publics. One of the more challenging aspects of the planning process has been to rigorously characterize the risks associated with each alternative, given the inherent lack of specificity that comes with strategic planning.

Lehmkuhl, John

John Lehmkuhl is a Research Wildlife Biologist with the US Forest Service, Pacific Northwest Research Station in Wenatchee, WA. He has been a research scientist with Forest Service research since 1988. For the last 18 years he has studied wildlife and disturbance ecology in interior Pacific Northwestern forests from the Wenatchee Forestry Sciences Lab in north-central Washington. His published work has addressed landscape ecology and forest fragmentation, wildlife population viability assessments, small mammal and avian ecology and management in Cascadian dry forests, dry forest landscape and stand restoration, regional science and management assessments, ungulate habitat dynamics, and the ecology and management of forests and grasslands in India.

Oral presentation, Wednesday, 2:05 PM, B116

Strategies for Restoring Fire Resilient Landscapes and Conserving the Threatened Northern Spotted Owl in the Eastern Cascade Range of Oregon and Washington, USA

Deviation from stable fire regimes and historical forest pattern, and increased wildfire severity and extent, are key consequences of 20th-century management of dry forests of the eastern Cascade Range ("eastside"). In response, managers developed science-based strategies and tactics over the past 15 years to restore vegetation patterns and processes, primarily reducing fuels to restore fire-resilient landscapes. Forest restoration often conflicts with habitat conservation for the threatened Northern Spotted Owl (NSO), which has been based since 1994 on the Late-Successional Reserve network of the Northwest Forest Plan (NWFP). Effectiveness of the reserves on the eastside has always been an issue. Habitat losses to insects and wildfires inside and outside reserves have risen steadily since 1972. Three-quarters of the eastside landscape is bounded by reserved areas, yet they contain only half of the habitat-capable lands. Eastside NSO populations have declined annually by ~4% since 1994. A controversial new management strategy was proposed in the 2010 NSO Recovery Plan to integrate eastside forest restoration and owl conservation across the entire landscape, not just in reserves. Most federal, non-wilderness lands would be managed to retain and recruit NSO habitat while restoring the dry forest ecosystem. The Vegetation-Fire-Owl Project (VFO) is modeling long-term patterns of vegetation, habitat, and NSO abundance to evaluate this and other strategies. We compare the NWFP reserve network, whole-landscape management alternatives that vary by treatment extent and intensity, and no management. We modeled current patterns of vegetation, wildfire risk, NSO habitat, spatial allocation of treatments, and future vegetation and habitat patterns. We used decadal NSO habitat outcomes in an individual-based NSO demography model, with Barred Owl interactions, to evaluate NSO population responses to strategies. We present preliminary results here. VFO results will inform revisions of eastside National Forest Plans, and the NSO Recovery Plan and Critical Habitat Rule.

Letz, Craig

Craig Letz. Fire Staff Officer. Central Oregon Fire Management Service (Deschutes and Ochoco NFs, Prineville District BLM). A native of Iowa, Craig began his federal career on the Clearwater-Nez Perce National Forest in Idaho and worked Grand Canyon and Crater Lake National Parks before moving to Central Oregon. He holds a BS in Forest Management from Iowa State University.

Plenary talk, Friday, 9:10 AM, Ballroom

A local perspective on fire policy implementation in Central Oregon

The Central Oregon Fire Management Service (COFMS) is a Service First organization that coordinates fire suppression and fuels management for the Deschutes and Ochoco National Forests and the Prineville District BLM, an area encompassing 12 million acres, 4 million of which are under federal management. Ecologically the region is very diverse, ranging from alpine and sub-alpine areas on the crest of the Cascade Mountains with over 150 inches of precipitation, to sage-steppe with under 10 inches. While the federal, state, and local fire agencies work very well together, the high amount wildland-urban interface, private land (both protected and un-protected by the state) and public recreation create many unique challenges (and opportunities). The size and shape of wilderness areas in the Cascades also make it difficult to meet wilderness management objectives. In my presentation I will discuss some of our challenges and lessons learned in how federal fire policy is implemented in Central Oregon.

Lininger, Jay

Jay Lininger is an ecologist with the Center for Biological Diversity in Albuquerque, New Mexico. He worked five seasons on private and federal fire and aviation crews, and is a charter member of Firefighters United for Safety, Ethics and Ecology (FUSEE). Jay co-authored the Community Wildfire Protection Plan for the City of Ashland, Oregon, and consults on the Four Forests Restoration Initiative to restore fire-adapted ponderosa pine forests on four million acres in northern Arizona. He holds a M.S. in environmental studies from the University of Montana, where he received the Graduate Student Excellence Award from the Association for Fire Ecology.

Oral presentation, Thursday, 3:25 PM, B112

Restoration of Fire-Adapted Southwestern Ponderosa Pine Forests: Expediting Treatments by Conserving Large Trees

Restoration treatments in fire-adapted southwestern ponderosa pine forests routinely employ logging of large-diameter trees despite their ecological importance and relative scarcity. Proponents of large tree removal assert that it is necessary to achieve restoration of historical forest structure. However, logging large trees is counterproductive to forest restoration, which requires widespread fire use at a landscape scale. There is near universal agreement among land managers and stake-

holders that restoration treatments should reduce hazardous surface fuels and small-diameter trees in order to facilitate re-introduction of fire where it has been excluded in the settlement era. This agreement supplies a basis for consensus that will expedite restoration efforts if implemented by land management agencies. Proposals to remove large trees perpetuate social conflict and delay restoration. Process-centered restoration that conserves large trees and emphasizes fire reintroduction is a practical and preferable means to protect human communities and promote forest resilience and biological diversity.

Loehman, Rachel

Rachel A. Loehman is a Research Ecologist with the US Forest Service Rocky Mountain Research Station, Fire Sciences Lab in Missoula, MT. Loehman's research focuses on understanding and assessing interactions among climate, disturbance processes, and terrestrial ecosystem dynamics, and development of methods to link ecosystem models with fire history, tree ring, and other long-term empirical data sets. Loehman's current projects include "Linking field-based and experimental methods to quantify, predict, and manage fire effects on cultural resources" (Joint Fire Science Program funding) and "Long-term vulnerability and resilience of coupled human-natural ecosystems to fire regime and climate changes at an ancient Wildland Urban Interface" (National Science Foundation funding).

Oral presentation, Wednesday, 3:50 PM, B112

A landscape in transition: Simulating climate, vegetation, and wildfire interactions in a central Oregon mixed-conifer ecosystem, Managing for resilient future forests (those that can forestall undesired effects of climate change or rebound to an initial state following disturbance) requires that we understand how forests functioned in the past and predict how fire regimes and forests may change with future climate change and land management. Models can be used to simulate ecosystem dynamics across broad areas, but few calibration data sets for these models exist; fewer still include multiple centuries of observations necessary to establish reference conditions. Conversely, tree-ring reconstructed fire and forest histories provide information on stand development and fire dynamics but do not capture ecological processes that operate at broad landscape and regional spatial scales. Calibration of models with long-term historical data sets can produce robust results with reduced uncertainty, critical factors when applying model results to land management issues.   Ecosystem process models linked to long-term fire and forest histories can be used to address questions that cannot be answered by tree rings alone. We coupled the mechanistic simulation model FireBGCv2 with reconstructed fire and forest histories in central Oregon to determine the extent to which the tree-ring fire and forest histories can be extrapolated to unsampled areas, assess whether current fire and forest structure, composition, and heterogeneity depart from past conditions, and project future fire regimes and landscape conditions under different climate change and land management scenarios. Results suggest that climate changes may potentiate shifts in wildfire regimes and vegetation outside of the historical range and variability for the study area, with commensurate effects on landscape carbon, wildlife habitat, forest structure, and other important ecosystem processes.

Loehman, Rachel

(See biographical information, above.)

Oral presentation, Tuesday, 11:25 AM, B110

Estimating critical climate-driven thresholds in landscape dynamics using spatial simulation modeling: Do climate and fire interact to produce ecological tipping points?

Twenty-first century climate projections forecast higher temperatures and variable precipitation for many landscapes in the western United States. Climate changes may cause or contribute to threshold shifts, or tipping points, where relatively small shifts in climate result in large, abrupt, and persistent changes in landscape patterns. Current research suggests that interactions of climate change and disturbance (e.g., wildfires) are more likely to trigger ecosystem transitions than either process in isolation.   We used the mechanistic simulation model FireBGCv2 to detect critical climate-driven thresholds in landscape dynamics. We developed sets of progressively warmer and drier or wetter climate scenarios that span the range of GCM projections for the western US, including temperature and precipitation combinations that may not be present in global-scale projections but may occur at finer (regional or local) scales. Climate scenarios were used to drive simulations potential future fire and vegetation dynamics in three study areas in the western United States - McDonald watershed, Glacier National Park (MT), the central plateau of Yellowstone National Park (WY), and the East Fork Bitterroot River basin (MT). These landscapes encompass a diverse range of biophysical settings, vegetation species, forest structure, and fire regime, and thus were expected to differ in their sensitivity to climate changes and exhibit unique threshold behavior following climatic and wildfire perturbations. Each of the study areas proved sensitive to simulated changes in tem-

perature and precipitation, as reflected in shifts in mean annual burned area, crown fire area, fire frequency, and fire-caused tree mortality. Sensitivity to climate changes differed across landscapes; moreover, shifts in basal area were strongly related to changes in area burned and fire regime characteristics, suggesting that synergistic interactions of climate and fire will be important in determining future landscape patterns.

Long, Alan

Alan Long is Professor Emeritus with the School of Forest Resources and Conservation, University of Florida. His teaching, extension and research activities focused on fire ecology and management, forest operations, forest stewardship and management opportunities for nonindustrial private forest landowners, and continuing education for professionals. He currently works with Tall Timbers Research Station as Administrative Director of the Southern Fire Exchange, a Joint Fire Science Program regional consortium for fire science technology transfer. Over the last 10 years, Alan has focused both research and outreach on WUI fire hazard assessments and issues. He received the AFE Herbert Stoddard Sr Lifetime Achievement Award in 2008.

Oral presentation, Tuesday, 4:40 PM, B111

JFSP Fire Science Regional Consortia: Collaborations and Partnerships – What Has Worked Really Well?

Working with other organizations and ongoing programs has been a key element of success for fire science transfer through the JFSP regional consortia. Sharing activities increases audience size, enhances cost effectiveness, and meets mutual needs of diverse organizations with an interest in applied fire science. Collaborations range from venues for workshops and research highlights at Prescribed Fire Council meetings, to joint planning for workshops and other activities with Fire Learning Networks and Landscape Conservation Cooperatives, to webinar production through several key partners, to website development. Some of these were planned when the consortia began, while others matured later. Our presentation will describe a variety of technology transfer activities that have benefitted from working with, and through, other organizations and conclude with a summary of how our collective learning curve in collaborations will improve future consortia programs.

Long, Colin

Colin J.Long, Associate Professor, Deparmtne of Geography and Urban Planning, University of Wisconsin Oshkosh. The first high resolution millennial-scale record of fire in the Pacific Northwest using sedimentary chacoal records (Long et al. 1998).

Oral presentation, Tuesday, 11:25 AM, B113

Millennial to centennial-scale climate controls on fire in the Oregon Coast Range

High-resolution macroscopic charcoal analysis was used generate a 36,000-year fire history from Little Lake in the Oregon Coast Range. This record was compared to a previous vegetation reconstruction from the site and relations between fire, vegetation, and climate were examined. Major findings include a dramatic shift in charcoal production, a proxy for biomass, occurred at the Holocene/Pleistocene transition (11,000 cal yr BP). This change was likely the result of increased forest productivity as temperature and moisture regimes increased. Fires during the late glacial (11,000 to 18,000 cal yr BP) Last Glacial Maximum (18,000 to 24000 cal yr BP) and the portion of Marine Isotope Stage 3 reconstructed, (27,000 to 36,000 cal yr BP), were not always associated with shifts in vegetation type or climate. This suggests that seasonal variations in precipitation were probably responsible and not longer-term climate variations. Our findings suggest that precipitation regimes have likely been the primary control on fire at Little Lake with summer temperatures also playing an important role. Periods with climate conditions that increase precipitation have lower fire occurrence while periods with climate conditions that suppress precipitation and have increased summer temperatures led to increased fire activity.

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. Prior to coming to the Fire Lab, 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 and has worked on a number of vegetation and fuels mapping and succession modeling projects. In 2003, Don began working with the LANDFIRE Project. He is currently the Fire Modeling Institute Science Lead for the LANDFIRE project.

Oral presentation, Wednesday, 1:15 PM, B110

LANDFIRE Existing and Potential Vegetation: Classification, Mapping, and Inventory at a National Scale

LANDFIRE fuel and fire regime products are based almost entirely on various combinations of existing and potential vegetation themes. Since LANDFIRE National's initial release in 2008, a number of revisions to these themes have been implemented both from a mapping and a classification standpoint. In addition, a large amount of additional inventory plot data have been brought to bear on many of the LANDFIRE mapping processes. This presentation will highlight methods used to develop and adjust the LANDIRE existing and potential vegetation classifications and improve the mapping related to these themes. In addition, the presentation will summarize the amount and nature of the inventory data used in this process and outline future mapping methods that leverage these data to better reflect local conditions.

Long, Donald

(See biographical information, above.)

Oral presentation, Wednesday, 3:50 PM, B110

Updating of LANDFIRE Vegetation and Fuel Data using Transition Modeling

One of the main objectives for the LANDFIRE project recently has been to update vegetation and fuel products to reflect disturbance and vegetation succession that have occurred on the landscape since the initial LANDFIRE National circa 2001 products. This process has resulted in the creation of a suite of circa 2008 vegetation and fuel products (LF 2008) and continues now toward creation of suite of circa 2010 products (LF 2010), to be released in the spring of 2013. This presentation will outline the process LANDFIRE has developed to produce these updated products illustrating how LF 2001 vegetation was "transitioned" in areas of disturbance and succession into LF 2008 vegetation as well as how the accompanying fuels products were updated.

Long, Jonathan

Jonathan W. Long Ecologist USDA Forest Service Pacific Southwest Research Station   Since 2005, I have worked with Apache participants from the tribal community of Cibecue in the Ndee Bini'bida'ilzaahi (Pictures of Apache Land) project to evaluate how ecologically and culturally significant places have changed using traditional ecological knowledge and collection of scientific data.

Oral presentation, Tuesday, 3:25 PM, C120

Blowout at Turkey Spring: severe channel erosion continued 8 years after the Rodeo-Chediski wildfire

We evaluated erosion of a spring-fed wetland area known as Turkey Spring in the Mogollon Highlands of east-central Arizona for 10 years following the Rodeo-Chediski wildfire of 2002. The 71 hectare watershed of the site had mostly burned at high severity. Because a spring was known to be present, the site was evaluated as part of a post-fire rehabilitation survey effort under a Burned Area Emergency Rehabilitation plan. In subsequent years, a community-based program involved local high school and college students in measuring a series of cross-sectional and longitudinal surveys to quantify soil losses from the site through time. We measured soil loss of 7400 cubic meters across a 550 m long study reach that included the most extreme areas of erosion, as documented with repeat photography. While previous research suggested that most post-wildfire erosion occurs in the first three years after wildfires, our measurements indicate that erosion at this site continued to increase until 8 years after the fire, as gully headcut erosion progressed upstream. Previous evaluations of post-wildfire treatments also have discouraged the use of in-channel treatments to stabilize channels following wildfire. Our results suggest that post-wildfire stabilization may also be needed to conserve in-situ values such as wetland habitats. The findings reinforce previous studies that noted that relatively small areas along stream channels can be a major source of post-fire erosion and can pose threats to local aquatic habitats. Similar post-fire surveys that target sensitive wetland resources and look for signs of channel instability should be considered following high severity wildfires in similar landscapes.

Lu, Ping

Ping Lu, Manager Ecology, Energy Resources of Australia Ltd, is a plant ecophysiologist working mainly on issues related to water in the plant and soil, with more than 25 years research experience. Previously Ping worked with INRA in France and CSIRO in Australia for 15 years. Since 2007 Ping has been working on ecological rehabilitation of an uranium mine site that is surrounded by, but separate from, the world heritage listed Kakadu National Park, in the north of Australia. Ping is a member of the Editorial Review Board of the international journal Tree Physiology.

Oral presentation, Thursday, 2:05 PM, B114

Dynamics of whole tree transpiration of a mixed Eucalyptus woodland pre-, during and post a hot bushfire in the wet-dry tropics

As part of a large scale ecohydrological study, tree transpiration (represented by xylem sap flux densities) in 32 trees from a native mixed Eucalypt woodland were monitored in the wet-dry tropics of northern Australia in 2008. A hot wildfire ravaged the study area towards the end of 6 months long dry season. The fire caused various degrees of damage to the tree canopies from total defoliation to almost no defoliation, depending on their topographic locations in the catchment. Fortunately all monitoring equipment survived the fire and recorded all the environmental and sap flow data over this unplanned event. Before the bush fire arrived at the area, transpiration was declining and low at 7:00-8:00 PM. Upon arrival of the fire transpiration rapidly increased and remained high over several hours. In the next 1-3 days daytime transpiration declined rapidly to near zero in all totally scorched trees as the result of total defoliation. Reduction in transpiration closely correlated with degree of damage to the canopy. Interestingly those scorched canopies started re-sprouting within 2 weeks after rainfall totaling 50 mm over 1 week. The canopy reached a coverage higher than the pre-fire level within 30-40 days after the burning. Whole tree transpiration recovered progressively over this period and reached a level similar to or above the pre-fire level. The amazing speed of recovery of transpiration (sap flow), a key physiological function of the tree, reflected the high level of resilience of the natural woodland in the monsoonal wet-dry tropics of northern Australia to adverse natural disturbances, in this case, a hot fire. This resilience is apparently achieved by the right mixture of tree species evolved and adapted to the local fire regimes. The ultimate purpose of this study is to provide key knowledge to the establishment of a self-sustaining woodland on a rehabilitated mine site.

Lundberg, Brenda

Brenda Lundberg is a Senior Scientist with Stinger Ghaffarian Technologies (SGT, Inc.) contracting with the DOI USGS Earth Resources Observation and Science (EROS) Center. Brenda Lundberg is the LANDFIRE Reference Data Administrator and she has worked with the LANDFIRE program for 8 years. She has been instrumental in procuring, compiling, and maintaining one of the largest collections of geo-referenced vegetation/fuel plot data and disturbance/treatment data which LANDFIRE uses to develop and update data products. She received her B.A. degree in Environmental Biology from Beloit College in 1996 and her M.S. degree in Fire Ecology from Western Washington University in 2002.

Oral presentation, Wednesday, 11:25 AM, B110

LANDFIRE Reference Data

To help develop and update LANDFIRE data products, LANDFIRE has relied on a vast collection of geo-referenced data. LANDFIRE 2001 National data collection efforts were focused on vegetation and fuel plot data, which were processed into the LANDFIRE Reference Database (LFRDB). The LFRDB provided "ground-truth" data for mapping and modeling vegetation patterns and conditions and for calibrating models developed by the LANDFIRE team. The LFRDB contains 817,393 vegetation and fuel plots located throughout the United States. There are 629 different sources of data archived in the LFRDB. Multi agency data sources, US Forest Service, State agencies, and the Bureau of Land Management made significant data contributions. The data archived in the LFRDB includes species composition data, vegetation structure data, community classification labels, exotic plant data, and fuels data. During LANDFIRE's update phase, LANDFIRE 2008 (Refresh), data collection efforts were focused on disturbance, vegetation/fuel treatment, and exotic plant polygon data that were processed into the Events geodatabase. Events data were used to update existing LANDFIRE products to reflect landscape changes due to disturbances and treatments. The Events geodatabase contains 929,267 event perimeters located throughout the United States. There are 408 different sources of data archived in the Events geodatabase. The US Forest Service, multi agency data sources, the Bureau of Land Management, and State agencies made significant data contributions. The data archived in the Events geodatabase includes information on wildland fires, mechanical treatments, chemical treatments, weather disturbances, insect and disease, and exotic plant locations. Data were added to the LFRDB during LANDFIRE 2008 (Refresh) on an as need basis. As LANDFIRE moves into the next update phase our data collection efforts continue to focus on Event or disturbance and treatment polygon data and the LFRDB will be maintained and updated as needed.

Lydersen, Jamie

Jamie Lydersen is a Biological Science Technician at the USDA Forest Service, Pacific Southwest Research Station. She recently published an article in Ecosystems entitled "Topographic variation in structure of mixed-conifer forests under an active-fire regime."

Oral presentation, Wednesday, 4:15 PM, C120

Fire effects on forest structure and composition in riparian and adjacent upland areas under an intact modern fire regime

Several recent wildfires in the Sierra Nevada suggest that, if left untreated, riparian forests can burn at high severity and may accelerate the spread of fire through a watershed. Stakeholders, however, are concerned that any fuel reductions within riparian buffer zones may adversely impact ecosystem services such as sensitive plant, wildlife and fish habitat, and water quality. At present, managers have little historic information or scientific data upon which to develop guidelines for riparian fuels reduction and restoration treatments. We measured overstory and understory structure and composition in mixed-conifer forests with a relatively intact modern fire regime in Yosemite National Park. All sample sites experienced at least two fires in the last 40 years, the most recent fire having occurred within the last 20 years. We inferred the direction of fire spread using fire progression maps and weather data, and included only sites where the fire approached from a direction roughly perpendicular to the stream. We compared overstory and understory structure and composition between paired upland and riparian plots. Initial results indicate that riparian plots generally had a lower quadratic mean diameter, a greater stem density and roughly similar basal area and shrub cover to adjacent upland plots. Indirect measures of fire intensity, such as char bole circumference and height, and height to live crown suggest fires generally burned at lower intensity in riparian areas. Differences between upland and riparian fire intensity and forest structure appear to result from a combination of fire effects, topography and stream channel characteristics. These results suggest restoration treatments may need to vary with fuel load and stream physiographic conditions to effectively mimic intact fire-regime effects in riparian areas.

Malllek, Chris

Chris Mallek University of California, Davis

Oral presentation, Tuesday, 2:05 PM, B112

Cone behavior in a rare, serotinous cypress

Serotinous plants are often thought to require fire for effective seed dispersal and recruitment. However, a number of recent studies of serotinous species in the Cupressaceae indicate that cones of these species can open and release seed in response to death of the cone tissue and subsequent desiccation, even in the absence of high heat loads. This is potentially an important trait because it may enhance the ability of populations to persist in the face of protracted fire-free intervals and mechanical disturbance. This study examined 1) the extent to which cones of McNab cypress (Hesperocyparis macnabiana), a rare serotinous conifer endemic to northern California, open in the absence of heat, and 2) how this behavior varies across the species' range. Cones were sampled from 13 populations throughout the species range, and were then placed at room temperature and surveyed at 7, 15, 30, 60, 120, and 240 days following the start of the treatment. After 240 days, the proportion of cones exhibiting at least partial separation of the cone scales ranged from 73% to 82% across all the populations surveyed; however, the proportion of cones that had opened enough to release seed ranged from 33% to 43%, indicating that while most cones from McNab cypress populations respond to desiccation in the absence of high heat loads, most cones fail to respond in a way that influences recruitment. Hierarchical mixture models revealed that variation among populations in both cone scale separation and seed release was minor in comparison to the variability observed among trees within a given population, or among cones from the same tree. Interestingly, relative cone age was a strong predictor of cone response, such that younger cones opened more readily than older cones.

Marschall, Joseph

Joe Marschall is a Senior Research Specialist at the Missouri Tree-ring Laboratory. He is also a part-time graduate student at the University of Missouri, and Coordinator for the Oak Woodlands and Forests Fire Consortium.

Oral presentation, Wednesday, 3:25 PM, C122

Prescribed fire scars and timber product value loss

Prescribed fire is used for a variety of management tasks on sites containing merchantable sized trees. Prescribed fire can create fire scars on trees which then serve as entrance points for wood degrading agents, sometimes leading to timber product volume and quality loss. Little information exists describing the relationship(s) between fire scarring and timber product values. We analyzed fire scars and dimensional lumber from the lowest logs of 88 fire scarred red oak trees (Quercus velutina, Q. rubra, and Q. coccinea) harvested from three sites in southern Missouri. Trees with varying degree of external fire damage, time between fire scarring and harvest (residence time), and diameter at breast height (DBH) were

harvested and milled into dimensional lumber. Lumber grade changes and volume losses due to fire scarring were tracked through individual boards (n=1298, 18.3 cubic meters (7754 board feet)). Observed and expected volumes and grades were compared and significant predictors of value loss were fire scar dimensions related to tree size and residence time. Value and volume losses due to fire scarring were surprising low. Average volume and value losses per lowest log were 3.91 and 10.33 percent respectively. This study suggests that small (< 51 cm tall) fire scars injuring less than 20 percent of the basal circumference on red oak trees of at least 25 cm DBH typically lead to minimal value losses. If these scar size values are exceeded, nearly no value loss occurs if trees are harvested within three years of fire damage, though value loss increases with residence time beyond three years.

Martell, David

David Martell is a Professor in the Faculty of Forestry at the University of Toronto. He completed his B.A.Sc., M.A.Sc. and Ph.D. in Industrial Engineering at the University of Toronto where he studied Management Science and Operational Research and their application to forest fire management. In 2009 the Canadian Operational Research Society awarded him its Award of Merit for "his outstanding contributions to the development and application of operational research in forest management in Canada and the world, and for his many contributions to the Canadian Operational Research Society."

Oral presentation, Wednesday, 2:30 PM, C122

The evolution of forest fire management in Northeastern Ontario

Forest fire management began in the province of Ontario Canada in 1885 when the provincial government hired 37 fire rangers to patrol forested areas, extinguish fires and carry the prevention message to settlers and others living and working in and near forested areas. Since that time Ontario's fire management program has been influenced by changes in policy, administrative structure, funding levels, prevention, detection and suppression technologies, climate and many other factors. We have compiled a digital database of the 8949 fires that occurred in a 43,390 square kilometre portion of northeastern Ontario that were managed by the Ontario Ministry of Natural Resources and its predecessors. Since the inception of formal forest fire management in Ontario Ontario's fire managers who first relied primarily on canoes and rudimentary hand tools developed and adopted many new transportation, suppression and information technologies. They, for example, subsequently adopted the use of motorized boats, motorized vehicles designed to travel on railway tracks, trucks, fixed-wing aircraft and helicopters designed to reduce initial attack response times and enhance their ability to support on-going suppression operations. They also developed and adopted the use of progressively lighter and more powerful portable power pumps designed to facilitate the delivery of water to the fireline, better hand tools and camping equipment and infrared scanners. Beginning in the 1920's they began to use both fixed-wing and rotary-winged airtankers that have been to support crews on the fireline, and more recently they developed and adopted fire danger rating systems that can be used to help predict when and where fires might occur and how they might behave and computer-based decision support systems to enhance their performance. We present the results of our preliminary statistical analyses of the extent to which such changes may have influenced fire and its management in northeastern Ontario.

Martin, Randall

Adam Martin is currently with the Center for Natural Lands Management where he assists in the design, implementation, and analysis of prairie restoration projects within Southern Puget Sound. His research interests include applied ecology, modeling, community interactions, and the restoration and conservation of rare plants.

Oral presentation, Thursday, 11:25 AM, B111

Fire application technique alters fire intensity, severity & post-fire prairie plant communities

Prescribed fire has become a foundational tool in prairie restoration. As practitioners become increasingly familiar and skilled with the application of prescribed fire in prairies and grasslands, it is important to understand how different fire application methods might meet or hinder desired restoration outcomes. In the prairies of the Willamette Valley-Puget Trough-Georgia Basin Ecoregion, fire has been reintroduced as a tool for reducing invasive plant cover and promoting the growth and establishment of native plants and associated butterflies. Head or backing fires are the two primary methods used to complete burns, and it is unknown how effective either of these methods are at achieving restoration goals. We used observations from one prairie fire to see how application methods changed fire intensity, severity, and post-fire plant communities, and if these changes led to the desired restoration objectives. We found the application of backing fires led to higher fire intensity and severity which favored an increased cover of non-native forbs, while head fires promoted an increase in native species richness. We also found that specific plant species were associated with different application

methods. While both methods were successful at reducing the cover of invasive and introduced grasses, due to an increase in non-native forbs, overall non-native cover actually increased. If these patterns are repeatable across burns, using head fires may be more desirable than backing fires at balancing the control of invasive and introduced species and enhancing native species.

Matonis, Megan

Megan S. Matonis is a PhD student with the Department of Forest and Rangeland Stewardship at Colorado State University and a graduate student cooperator with the Science Integration and Application Staff at the Rocky Mountain Research Station. The focus of her dissertation research is on collaborative landscape-scale restoration of ponderosa pine and mixed conifer forests along the Colorado Front Range and Uncompahgre Plateau. She received her B.S. degree in Natural Resource Management in 2007 from CSU and her M.Sc. in Forestry in 2009 from Michigan State University.

Oral presentation, Tuesday, 2:05 PM, B117

Comparing predictions of crown fire hazard across the Uncompahgre Plateau, Colorado

Collaborative groups are undertaking fuel reduction treatments to reduce crown fire hazard across the West. These groups need information on potential fire behavior and the associated precision of operational fire models. Towards this end, our project compares predictions of crown fire hazard across the Uncompahgre Plateau in western Colorado using four fire models with different parameterizations of crown fire behavior. We identified different stand categories based on slope classes and forest cover types using digital elevation models and a 1-m2 resolution map of forest cover types developed by researchers at the University of Montana and Rocky Mountain Research Station. We assigned and customized the most appropriate fuel beds for FCCS and fuel models for FlamMap, NEXUS, and CFIS based on field measurements of surface and canopy fuels. We ran the four fire models for each of our stand categories to predict incidence of crown fire from FlamMap, crown fire potential from FCCS, crowning index from NEXUS, and probability of crown fire from CFIS under 95th percentile weather conditions. Predictions from each model were converted into a 4-category index of relative risk (0–25th, 25th–50th, 50th–75th, and 75th–100th percentiles) based on model output across stand categories. We applied these predictions back onto our landscape-scale map of stand categories and assessed: (1) the percentage of the landscape where all models predicted a similar relative-risk of crown fire, (2) the sizes and spatial arrangements of areas with similar predictions, and (3) pair-wise model agreement for predictions by forest type. Other researchers have compared the performance of FlamMap, NEXUS, and CFIS for several sites, but we make a unique contribution by including the comparison to FCCS and by providing an assessment of systematic differences and similarities among models when predictions are applied across a forested landscape.

McCaffrey, Sarah

Sarah M. McCaffrey, Ph.D. is a Research Forester for the USDA Forest Service, Northern Research Station. Her research focuses on the social aspects of fire management. This has included National Fire Plan and Joint Fire Science sponsored projects examining the characteristics of effective communication programs and the social acceptability of prescribed fire, thinning, and defensible space. More recently she has begun work on the social issues that occur during fires including alternatives to evacuation and community-agency interactions during fires. She received her PhD in Wildland Resource Science from the University of California at Berkeley where her research examined Incline Village, Nevada homeowner views and actions in relation to defensible space and fuels management.

Oral presentation, Wednesday, 3:25 PM, B117

Loss of Landscape and Community Health: Impacts on Local Residents One Year After the Wallow Fire

As wildfires in the United States grow in frequency and size, the number of individuals impacted by wildfires is increasing. While a significant body of research has been conducted to understand the response of those living in fire prone areas to wildfire prior to an event, little work has been undertaken to understand the long-term impacts a wildfire may have on the well-being of individuals who have been directly affected by a fire. Understanding the long-term impacts, if any, a wildfire may have on community members will be important in developing programs that minimize negative outcomes and foster more resilient fire adapted human communities. This presentation will present initial findings from a survey of local residents one year after the 2011 Wallow fire in Arizona. The goal of the study was to identify impacts the fire has had on several aspects of community health. Factors assessed include physical and mental health outcomes, and how household economic factors and fire impacts on the surrounding landscape contributed to more positive and negative outcomes.

McCaffrey, Sarah

(See biographical information, above.)

Plenary talk, Tuesday, 8:20 AM, Ballroom

The Public and Wildfire: Conventional Wisdom versus Reality

Helping future policies and management practices improve landscape health will require improving our knowledge of not only ecological processes, but also of relevant social processes. As public views of appropriate land and fire management can affect efforts to improve forest health and minimize fire risk, having an accurate understanding of public response to fire and fuels management is essential. One barrier to current efforts to engage the public may be that many standard descriptions of the public's perspective on wildfire are based primarily on conventional wisdoms that may or may not hold. This talk summarizes findings from over 60 fire social science studies with particular emphasis on the accuracy of various accepted truths about the public and fire management. These studies indicate that few of these conventional wisdoms are supported and that a variety of factors interact to shape approval of different fuels treatments and fire management practices. A primary finding of this research is that familiarity with a practice, particularly its ecological benefits, is a key element shaping support for the practice. Thus active outreach will be integral in fostering public support for forest health and fire risk reduction efforts.

McGranahan, Devan

Research interests include rangeland fire ecology in working landscapes. I'm also interested in how the fire-grazing interaction can be applied to promote biodiversity in production grazing systems.

Oral presentation, Wednesday, 3:50 PM, B115

An invasive cool-season grass reduces fire spread, alters fire regime in a native, warm-season grassland

When invasive grass species alter fire regime, they generally increase fire spread by increasing the fuel load and continuity of native grassland fuelbeds. We suggest that invasive grasses that are photosynthetically active while the native plant community is dormant reduce fire spread by introducing high-moisture, live vegetation gaps in the fuelbed. We describe the invasion pattern of a high-moisture, cool-season grass, tall fescue (Schedonorus phoenix (Scop.) Holub), in tallgrass prairie, and use spatially-explicit fire behavior models to simulate fire spread under several combinations of fuel load, invasion, and fire weather scenarios. Reduced fuel load and increased extent of tall fescue invasion reduced fire spread, but high wind speed and low relative humidity can partially mitigate these effects. We attribute reduced fire spread to asynchrony in the growing seasons of the exotic, cool-season grass, tall fescue, and the native, warm-season tallgrass prairie community in this model system. Reduced fire spread under low fuel load scenarios indicate that fuel load is an important factor in fire spread, especially in invaded fuel beds. These results present a novel connection between fire behavior and asynchronous phenology between invasive grasses and native plant communities in pyrogenic ecosystems.

McKinley, Mason

Mason McKinley works for Center for Natural Lands Management (CNLM) in Olympia, Washington, where he manages a cooperative conservation program with Joint Base Lewis-McChord. He is also CNLM's fire manager and acts as regional coordinator for Puget Sound's ecological burn partnership.

Oral presentation, Thursday, 3:50 PM, B116

Mobilizing ecological burners – building a grassroots burn program in Puget Sound

Biologists and conservation land managers in the Puget Sound have built a fire program from the ground-up, and in the past three years have completed more than 150 prescribed fires. Puget Sound offers a patchwork of residual oak and prairie habitats that have persisted after 150 years of fire removal and development pressure. These fire dependent ecosystems have been degraded and replaced by conifer forest, brush and invasive plant species. Loss of habitat has resulted in declines and losses of several endemic species. Land managing agencies, non-profits and private parties have established a collaborative effort to protect and restore these now rare and fragmented habitat types. Re-establishment of a frequent fire regime is a key component to an integrated restoration strategy. Without reliable support from local fire management agencies, partnering biologists and land managers have developed a network of trained fire personnel, equipment infrastructure, science and political support, all on a limited budget. These steps made it possible for the partnership to do far more than could be done by individual organizations to bring fire to the fringes of the highly populated Puget Sound and regularly put

up smoke that is visible to the state's capitol. Over the past four years, the program has gone from producing only 1-2 burns per year and now has proven capacity to complete more than 40 burns - primarily durning the summer wildfire season.

Meigs, Garrett

Garrett Meigs is a PhD candidate in the College of Forestry at Oregon State University. He is a NASA Earth and Space Science Fellow studying the interactions of insect and wildfire disturbance in the Pacific Northwest. He also grew up in a zoo.

Oral presentation, Wednesday, 2:05 PM, B114

Contemporary mega fires in the Pacific Northwest: What drives the biggest of the big?

What are the drivers and ecological impacts of so-called mega fires? Are there generalities among the biggest of the big? This presentation investigates the largest 20 forest fires in the Pacific Northwest Region from 1984-2010. Specifically, we use the MTBS dataset and multiple lines of inquiry to characterize fire extent, effects, ignition source, timing, climatic and weather conditions, vegetation and fuel type, topography, attempted fire suppression, and pre-fire insect damage. By looking at the dominant drivers of multiple large fire events in Oregon and Washington states, we elucidate commonalities as well as unique contributing factors. Across forest landscapes of the PNW, although the largest 20 fires accounted for 4% of large fire ignitions (n = 500 fires >400 ha in forested ecoregions), they encompassed 36% of large fire extent (775,000 of 2,146,000 ha). In general, these top 20 fires occurred on lands administered by the US Forest Service, and they were ignited by lightning (17 lightning, 3 anthropogenic) in remote areas with rugged topography and limited initial firefighting response. In addition, the top 20 fires tended to occur in relatively dry, mixed-conifer forest types and exhibit complex fire behavior creating mixed-severity mosaics. About one third of these large fires occurred in areas with substantial pre-fire insect disturbance activity, highlighting the potential for complex disturbance interactions. A strong majority of large fires occurred in the most recent decade of the MTBS record (14 of 20 fires occurred since the year 2000), supporting the common assumption that the very large fires have become more frequent over time. The 2002 Biscuit Fire (~200,000 ha), the largest fire in the contemporary fire record, was nearly three times larger than the next largest fire, the 2006 Tripod Fire, and the median extent of all top 20 fires was 23,000 ha. Given projected increases of fire activity in western forests, the accurate characterization of the spatiotemporal patterns and impacts of fire will become increasingly important.

Meigs, Garrett

(See biographical information, above.)

Oral presentation, Wednesday, 3:25 PM, B118

Insects and wildfires across Pacific Northwest forests: A photographic journey through space and time

Fire is a pervasive force in many forest ecosystems, but it is not the only big disturbance in western North America. In recent decades, insect outbreaks have encompassed more area than wildfires. The apparent increase of both disturbances has sparked concerns about their potential interactions in space and time, as well as speculation about their future dynamics. But, what do these disturbed forest stands and landscapes look like, and how do they change over time? Drawing on photographs and maps covering a range of ecoregions and spatiotemporal scales, this presentation surveys the entomodiversity and pyrodiversity of Oregon and Washington forests. Looking across diverse regions like the Pacific Northwest allows us to see the range of possibilities and appreciate how diverse and dynamic these disturbance processes really are. From bark beetles and defoliators to suppressed fires and mega fires, change is the only constant in these forests, and management for change is becoming the new paradigm. Indeed, in the coming decades, these multiple disturbance interactions are likely to present increasingly complex management challenges.

Menakis, James

James Menakis is the National Fire Ecologist for the Forest Service (FS) Washington Office Fire and Aviation Management. His primary responsibilities include evaluating fuel treatment effectiveness, developing a fuels monitoring program, and governing board member on Joint Fire Science Program. Prior to 2011, Menakis worked at the Missoula Fire Science Laboratory for over 20 years on the FS Hazardous Fuels Prioritization Allocation System, mapping Wildfire Potential and developing Coarse-Scale spatial data including Fire Regime Condition Class. Menakis was also the lead for the LANDFIRE Rapid Assessment and GIS coordinator for the Interior Columbia River Basin Scientific Assessment Project - Landscape Ecology Team. He received his B.S. degree in Forestry and M.S. degree in Environmental Studies from the University of Montana.

Oral presentation, Tuesday, 1:40 PM, B116

The Future of Fire Regime Condition Class – Where We Have Been, Where We Need To Go

Fire Regime Condition Class (FRCC) is a qualitative measure describing the degree of departure from historical fire regimes. This departure results in changes to fire frequency, severity, and pattern, and could have been caused by any of the following factors: fire suppression, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, introduced insects and diseases, or management activities. Since its inception, FRCC has been embraced by many members of the national fire management community. It has been: incorporated by federal agencies into responses to General Accounting Office reports critical of wildland fire management, incorporated into the Healthy Forest Restoration Act, and used as a tool to help prioritize resources and fuel treatments at a national level. Over this time period, FRCC has been found to correlate well with several large catastrophic fires; this correlation has led to FRCC being perceived as a measure of fire risk. Though there is a strong relationship between FRCC departure that occurs on the historically frequent low intensity fire regimes and catastrophic wildfires, FRCC is not a measure of fire risk. Also, through its development, the methods for calculating FRCC have evolved from historical fire regime departure to both fire regime departure and vegetative departure. For most mapping projects, only the vegetative departure can be delineated, because of the lack of fire history data. This presentation will review the history of FRCC, its definitions and evolution over the last several years, the difficulties in mapping it, and some potential new methodologies. Based on this information, suggestions on where we need to go in the future will be discussed.

Menakis, James

(See biographical information, above.)

Oral presentation, Tuesday, 2:05 PM, B116

Fuel Treatment Effectiveness Monitoring and Lessons Learned

The effectiveness of the hazardous fuels treatment program in reducing wildfire impacts have not been sufficiently demonstrated to Congress, OMB, and the public. Demonstration and evaluations of fuels treatment effectiveness is needed to improve the hazardous fuels reduction program and to maintain current and future funding levels. In this presentation, hazardous fuel treatments will be evaluated based on mostly two key management questions: 1) Did the hazardous fuel treatment, as designed in the treatment objectives, change the wildfire fire behavior characteristics; and 2) Was the hazardous fuel treatment used in helping with the suppression of the wildfire. The presentation will focus mostly on the 2011 and 2012 wildfire season and will highlight: 1) the Fuel Treatment Effectiveness Monitoring (FTEM) system now being used by the USDA Forest Service and US Department of Interior Bureaus; 2) the importance of monitoring fuel treatment effectiveness; 3) the effectiveness of past wildfires that were managed for resource benefits on new wildfires; and 4) some of the lessons learned both in monitoring and effectiveness of hazardous fuel treatments. Examples of fuel treatment effectiveness success stories and the key elements that lead to success will be discussed. Some fuel treatments that did not meet their objectives and some of the reasons why will also be discussed.

Meng, Ran

I am Ran Meng, a third year PhD student from University of Utah. My research interests concentrate on application of GIS and remote sensing techniques in the field of environment and natural resources. One paper called "Detection of Tamarisk Defoliation by the Northern Tamarisk Beetle Based on Multitemporal Landsat 5 Thematic Mapper Imageryt" was just published as first author in the GIScience & Remote Sensing Journal (49 510-37,2012).

Oral presentation, Thursday, 1:40 PM, B114

Remote sensing assessment of vegetation recovery after fire in Southern California

Wildfire is a dominant disturbance in Southern California vegetation communities that heavily influences local ecological processes. The objectives of this study are to monitor the recovery pathways of vegetation communities following fires in Southern California, and analyze the factors correlated with recovery rates in the years following fires. The area disturbed by wildfire during 1986-1995 period, delineated using GIS data layers of statewide historical wildfire, were monitored using Landsat TM data. For each fire a paired control site was selected, and time-series normalized burn ration (NBR) for 1985-2010 was used as the indicator of vegetation recovery over time. A Kolmogorov-Smirnov (KS) test was implemented to compare NBR values from fire and control groups for three main vegetation types: shrub, grass and forest. The D value from the KS test was used to monitor recovery trajectories following wildfires for each vegetation type. Among the three

vegetation types, grass returned to low NBR distribution differences within a few years following fire, with shrub and forest classes often requiring more than a decade. Wet season precipitation, aspect, and slope will be discussed as factors correlated with recovery rate using Analysis of Variance (ANOVA).

Merschel, Andrew

Andrew G. Merschel is a Graduate Research Assistant at Oregon State University and is working in collaboration with the US Forest Service Pacific Northwest Research Station in Corvallis, Oregon. Andrew is studying how structure, composition, and tree growth on the Deschutes and Ochoco National Forests vary across old-growth mixed-conifer forests. An improved understanding of how fire suppression and logging have altered this forest type is essential to inform restoration and management decisions.

Oral presentation, Wednesday, 3:25 PM, B112

The current state of mixed-conifer forests of the Eastern Cascades and Ochoco Mountains

Selective harvest of mature ponderosa pine and other fire resistant trees coupled with fire suppression has favored the establishment and growth of Douglas-fir and grand fir in old-growth mixed-conifer forest (OMCF). Patchy late seral forest composed of mature fire resistant species has been replaced by forest with a dense shade tolerant understory, multilayered structure, and high spatial contagion. Shifts in structure and composition are a concern because they result in increased mortality due to high-severity wildfire, insects, and drought. We recorded structure and composition of OMCF at eighty-eight sites in the Deschutes and Ochoco National Forests and extracted 1450 increment cores at sixty-six of these sites. Cluster analysis identified five distinct stand structure and composition types in the eastern Cascades and five types in the Ochoco Mountains. To isolate and understand environmental controls on structure and composition we related OMCF types to topographic and climatic gradients using Nonmetric Multidimensional Scaling. OMCF types in the Eastern Cascades are distinguished by a broad climatic gradient of increasing precipitation and elevation associated with coarse-scale physiographic features. In comparison OMCF types in the Ochoco Mountains are more strongly distinguished by topographic complexity at relatively fine scales. A forty percent reduction in density of mature ponderosa pine occurred as a result of selective logging in OMCF. All stands types demonstrate a distinct increase in establishment of all species during the late 19th and early 20th century. Dry-mixed conifer stand types have cohorts of shade tolerant Douglas-fir and grand fir establishing after the 1890s with no evidence of prior establishment. In contrast in wet-mixed conifer stand types Douglas-fir and grand fir established continuously for the past two centuries. A decrease in ponderosa pine recruitment accompanied by growth suppression in mature ponderosa pine indicates total stand densities of 350-800 trees per hectare are novel on the landscape.

Metlen, Kerry

Kerry Metlen, Forest Ecologist for The Nature Conservancy in Medford, Oregon researches forest ecology, participates in collaborative forestry groups, and coordinates the multiparty monitoring for the Ashland Forest Resiliency Project. He earned a Ph.D. in Organismal Biology and Ecology at The University of Montana, a M.S. at The University of Montana's College of Forestry and Conservation, and has published papers as part of the Fire and Fire Surrogates project, a nationwide study investigating the impact of treatments designed to return or mimic fire in fire adapted forests.

Oral presentation, Wednesday, 4:15 PM, C121

Forensic forestry to guide restoration in Mediterranean mixed conifer/hardwood forests of southwestern Oregon

Stand structure and composition of forests which historically developed with frequent fire can be used as references to inform actions to restore ecological resilience. In particular, information on how historical forest conditions varied with biophysical setting and fire frequency is needed to help guide project planning and stand level prescriptions that account for variability in forest conditions and fire effects in space and time. Our research investigates the tree species compositions and size distributions of presettlement Mediterranean mixed conifer/hardwood forests of interior southwestern Oregon and how these communities varied across the landscape. We identified all living and dead trees on 0.1 ha plots and reconstructed tree status and size to the date of the last wildfire (1911). Fifty plots were stratified among 10 biophysical settings across a 8,900 ha study area centered on the 5,665 ha Ashland Creek watershed. We investigated the proximity among trees within stands by mapping stems in 3-ha plots. Historically forests were dominated by large trees of Pinus ponderosa, Pseudotsuga menziesii, Abies concolor, Pinus lambertiana, and Arbutus menziesii. In absence of fire, the number of trees per hectare tripled and the basal area doubled between 1911 and 2011. Increased density resulted primarily from regeneration of shade tolerant species - Pseudotsuga menziesii in all biophysical settings and Abies concolor in plots from the Abies

plant series, dramatically shifting species and size class proportions. Arbutus menziesii increased in abundance primarily in the ridge settings. In stem-mapped plots we found larger gaps and a higher proportion of the plots in gaps in 1911, suggesting an opportunity for regeneration of shade intolerant species that was absent in 2011. Promoting resilience of these forests will entail promoting stand structures suitable for regeneration of shade intolerant species, and the development of large, fire resistant trees on a proportion of the landscape.

Miesel, Jessica

Jessica R. Miesel is a Research Associate with the Lake States Fire Science Consortium and The Ohio State University. Her current work is focused on increasing the awareness and accessibility of fire science research in the Lake States region.

Oral presentation, Tuesday, 1:40 PM, B111

Lake States Fire Science Consortium knowledge gaps assessment: increasing awareness and accessibility of regional results by management and research communities

The Lake States Fire Science Consortium is a network of land managers and scientists interested in the fire-dependent forest ecosystem types of Michigan, Minnesota, Wisconsin, and portions of Canada and New England. Although fire was an important historic disturbance in these forests, much less is known about its ecological role relative to more widely studied fire-dependent forests of the western or southern United States. Recent national syntheses of fire effects information have presented limited information from the Lake States region (LSR), and this region-specific information is critical for designing appropriate management activities and long-term forest planning. To synthesize existing regional information and to identify gaps in knowledge, we reviewed the literature on ecological effects of fire in the LSR. Our results indicate that the majority of existing research has focused on jack pine (Pinus banksiana Lamb.)-dominated forests, whereas studies in forests dominated by red (P. resinosa Aiton) or eastern white pine (P. strobus L.) are less common. Studies of wildfires are less common than studies of prescribed fire. Investigations of fire effects on wildlife were limited primarily to rodents and birds, with the federally endangered Kirtland's warbler (Setophaga kirtlandii Baird) the most frequently studied species. Many studies have investigated fire effects on soil nutrients, whereas effects on soil processes and microbial communities remain poorly understood. Post-fire chronosequences were common surrogates for long-term investigations. In general, information about fire effects in the LSR is highly disparate, and quantitative syntheses such as meta-analysis used for identifying overall trends are not possible with the limited current body of knowledge. Resolving knowledge gaps via future research, including studies developed through scientist-manager collaborations, will facilitate a more comprehensive understanding of fire science and management in the LSR. This work increases awareness of existing research and provides a regional context for future investigations.

Miller, Carol

Carol Miller, Research Ecologist, Aldo Leopold Wilderness Research Institute, Rocky Mountain Research Station, USDA Forest Service. Her program of research seeks to help land managers understand how to include wildland fire as an ecological process to landscapes.

Oral presentation, Tuesday, 4:15 PM, B114

Fire management tradeoffs: three wilderness case studies

Although some natural fires may be allowed to burn in many wilderness areas, many, if not most, other ignitions are suppressed. As a result, suppression decisions routinely alter wilderness fire regimes with myriad ecological effects. To evaluate the effects of suppression versus allowing fires to burn, we studied two contrasting fire seasons and three wilderness areas. First, we summarized the 2007 and 2008 fire seasons for the Bob Marshall (Montana), Selway-Bitterroot (Idaho and Montana), and Gila-Aldo Leopold (New Mexico) Wilderness areas in terms of effects on fuels, future behavior, and achievement of different land management objectives. We then contrasted these actual outcomes to alternative scenarios obtained through simulation modeling. Specifically, for each ignition that was suppressed in our three study areas in 2007 and 2008, we modeled their potential spread using actual weather scenarios. We used the results of our fire modeling and GIS analyses to quantify trade-offs among response strategies in terms of the outcomes of fuel reduction, fire behavior potential, and numerous ecological impacts.

Miller, Jay

Mr. Miller is responsible for the Landscape Fire Effects Monitoring Program for the Forest Service's Pacific Southwest Region. He was an initial member of the national interagency Monitoring Trends in Burn Severity (MTBS) team. 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. Jay has coauthored more than a dozen peer-reviewed journal articles on fire effects mapping and analysis of landscape level fire patterns.

Oral presentation, Thursday, 11:25 AM, B113

Do firing operations largely result in severe effects? The evidence from satellite derived severity data.

There has been concern expressed that firing operations (i.e., management-ignited fire) used to control wildfires is causing more severe effects (i.e., larger high-severity patches) than the fires would have otherwise caused, and therefore those types of suppression tactics should be discontinued. However, claims about severe effects have been based only upon anecdotal accounts from a few burned areas. But, it will always be possible to locate examples of firing operations that were more severe than surrounding areas, or vice versa, due to the variable nature of fire. The only unbiased way to evaluate whether the effects from firing operations at specific locations were more severe than if they had not been conducted, would be through fire behavior modeling. That type of analysis, however, would only result in site/circumstance specific evaluations that would not answer the broader question of whether the sum total of all firing operations result in more severe effects. The only way to answer that broader question is through some type of statistical analysis of the effects from all firing operations on a large sample of fires. But that would require mapping firing operation locations through extensive personal interviews of firefighters that could take years to conduct. Rather, as a preliminary examination, we assumed that firing operations are extensively used on large/long duration fires. If firing operations typically result in uncharacteristic amounts of high-severity, then a "bathtub ring" of high severity adjacent to control lines should be evident. To test that hypothesis we compared the percentage of high severity within buffers inside 76 fire perimeters to fire interiors. Our results suggest that firing operations do not cause higher severity than the fire itself, but rather, the percentage of high severity adjacent to fire control lines is directly related to the degree of severity within the whole fire.

Miller, Jay

(See biographical information, above.)

Oral presentation, Wednesday, 4:15 PM, C125

dNBR or RdNBR, is there one solution to mapping fire effects?

Since the late 1990's, fire severity mapping using passive satellites has evolved from a subject of research to an established practice. Currently there are three major national fire severity mapping programs using two different change detection methodologies (dNBR and RdNBR) to produce severity data products. Those data, both raw dNBR and RdNBR, and derived severity products, provide a fertile opportunity to provide answers concerning landscape fire effects that are of great interest to decision makers, land managers and the public. However, there is still a great deal of uncertainty, both conscious and unconscious, in the user community as to the applicability of those data for answering a wide range of questions for several reasons. First, "severity" is a value laden measure. Therefore, the degree of severity can be a matter of judgment, and can vary with the resource of interest. Second, there is an assumed level of accuracy simply because the data products appear on publicly accessible websites. Third, there are inherent limitations in the data products which can result in conflicting conclusions as to the actual effects on the ground. Finally, not all derived products are consistently available across all severity mapping programs, making it difficult for users to understand that differences in map products are at least partially driven by different program objectives. In this talk I will present examples of severity products produced by the national severity mapping programs, and examine their limitations and benefits.

Miller, Mary Ellen

Mary Ellen Miller is currently working as a research engineer at Michigan Tech Research Institute. Her educational background is Environmental Engineering, Imaging Science and Physics. She enjoys utilizing remotely derived image data in physically based environmental models. She has a strong interest in fire science especially fire effects and mitigation. Recent projects include mapping historical fires in Tundra, development of a physical model of post-fire dry ravel, reducing noise in LiDAR waveforms for determining forest biometrics and prioritizing fuel reduction treatments. She would love to work on BAER Teams (Burned Area Emergency Rehabiliation) as a hydrologist or GIS specialist. Her most recent accomplishment was modeling potential post-fire erosion for the High Park fire in Colorado.

Oral presentation, Thursday, 1:15 PM, C120

Rapid Response tools and datasets for post-fire erosion mitigation: Lessons learned from the High Park and Rock House Fires

Once the danger posed by an active wild fire has passed, land managers must rapidly assess the threat from post-fire erosion and runoff due to the removal of vegetation and litter layers from the forest floor and changes in soil properties. Increased runoff and sediment delivery are of great concern especially near wildland urban interfaces, cultural sites, municipal water intakes, and sensitive habitats. Planning the mitigation of these threats is typically undertaken by interdisciplinary Burned Area Emergency Response (BAER) Teams, who often must begin their work while the fire is still actively burning. Many modeling tools and datasets have been developed over the years to assist BAER Teams. Unfortunately the physically-based spatial models are currently under utilized as the models are difficult to set up and require inputs that depend upon the spatial distribution of burn severity and its impacts on vegetation, soil and land cover. When the Rock House fire burned 315,000 acres in Presidio and Jeff Davis Counties Texas, erosion modeling work could not be completed before the BAER Team report was due. Formatting spatial soil data was the primary problem. The solution is to prepare the data and tools before the fire occurs. This is exactly what was done for the High Park fire that burned 87,200 acres in Larimer County, Colorado. Spatial soil, land cover and DEM layers were prepared ahead of time along with methodology for rapidly merging satellite derived burn severity maps with the soil and vegetation data. The entire burn scar for the High Park fire was modeled in less than three days allowing the predictions to be available for operational use by the BAER Team. These case studies demonstrate the efficacy of preparing both the tools and datasets before they are needed.

Miller, Steven

Steven R. "Torch" Miller, Director of Land Management, St Johns River Water Management District Steve graduated from the University of Wisconsin Stevens Point with a degree in Forest Administration in 1985. He has since worked for a private forestry consultant, the USDA Forest Service, Texas Forest Service, and Florida Division of Forestry and is currently the Director of Land Management for the St. Johns River Water Management District. In his present capacity, Steve is responsible for directing a multiple use land management program on over 600,000 acres, including a fire program whose goal is to prescribed burn 65,000 acres/year. Steve has experience in both prescribed fire and fire suppression and is currently qualified as a Type I Burn Boss and a Type II Operations Section Chief. He serves as Operations Chief on the Florida Red Overhead Team. He is married and the father of two college students; one of whom aspires to be a second-generation forester and fire manager.

Oral presentation, Wednesday, 4:15 PM, B116

Using Prescribed Fire To Reduce The Risk Of Smoke Related Traffic Problems On I-95

In many areas of the United States, prescribed burning near highways is considered too risky because of the potential for smoke impacts to the highway. In one area in Florida prescribed fire is used to reduce the risks of smoke related impacts to Interstate 95. The St Johns River Water Management District manages over 400,000 acres of land. Seventy percent of those lands are wetlands, and nearly 200,000 acres of the wetlands are marsh systems which require fire for their perpetuation. Some of those marsh acres are immediately adjacent to Interstate 95 near Cocoa, in Brevard County, Florida. Prior to 1993, the District had no formal wildland fire program. All wildland fire management responsibilities on District lands were abdicated to the Florida Division of Forestry. In the 1980's Florida suffered several severe droughts and associated wildfire seasons. On multiple occasions, the marshes next to !-95 supported lightning ignited wildfires when the sites were so dry that organic soils began to burn. These wildfires burned for weeks, resulting in smoke impacts to I-95, and even smoke related vehicle accidents. In 1989, the Division of Forestry requested that the Water Management District begin to participate in a program to use prescribed fire on a frequent basis, at least every third year, in an effort to reduce the risk of wildfires that could ignite the organic soil. It took some time for the District to build a program capable of conducting a complex 4600 acre prescribed burn using aerial ignition immediately adjacent to an Interstate Highway, but in 1996, the first prescribed burn was conducted. Since that time that burn zone has been burned five additional times. The conditions under which the zone is burned are very exact,. So far, there have been no smoke related accidents from either prescribed burning or wildfires and, despite being subject to several severe droughts, the area has not supported a wildfire, since managed fire began.

Minas, James

Mr James P Minas School of Mathematical Sciences, RMIT University James is a final-year PhD candidate and a Bushfire Cooperative Research Centre scholarship holder. James' doctoral thesis work is on the use of operations research methods

for decision support in bushfire management. James' primary research interest is the use of operations research techniques such as optimization, simulation and stochastic modelling to aid in the development of strategic and tactical bushfire decision support systems.   Minas, J. P., Hearne, J. W., & Handmer, J. W. (2012). A review of operations research methods applicable to wildfire management. International Journal of Wildland Fire, 21(3), 189-196. doi: http://dx.doi.org/10.1071/WF10129

Oral presentation, Thursday, 11:00 AM, B112

Multi-period spatial optimization of landscape-level fuel management to minimize wildfire impacts

Fuel accumulation arising from modified fire regimes has contributed to an increase in the extent, severity and destructive impacts of wildland fires in a number of countries. Prescribed burning and other fuel reduction treatments are among the few management options available to authorities as they seek to reverse this trend. However, determining the optimal extent, spatial location and timing of fuel treatment is a highly complex undertaking. We present an integer programming model for multi-year scheduling of fuel treatments at the landscape level. Our model incorporates spatially-explicit ignition probability and values-at-risk information and considers both asset protection and ecological objectives together with a range of operational and cost constraints.

Montgomery, Claire

Claire A. Montgomery, professor, Department of Forest Engineering, Resources, and Management at Oregon State University, conducts research in economics of forest land management for traditional wood products, biomass, and biodiversity and economics of wildland fire. Her current research is in decision support tools for fire management planning on forested landscapes and for prioritizing fuel treatment to benefit rural communities. She teaches courses in microeconomic theory and forest resource economics. Relevant publications include "Spatial endogenous fire risk and efficient fuel management and timber harvest" with M Konoshima, HJ Albers, and JL Arthur in Land Economics (2008) and "Fire: an agent and a consequence of land use change" in Oxford Handbook of Land Economics (forthcoming).

Oral presentation, Tuesday, 3:25 PM, C121

Incorporating wildfire risk into operations research methods

The problem of optimal wildfire and fire fuels management is complex. It is spatial because of fire spread and because some of the values at risk depend on spatial configuration of vegetation. It involves fundamental uncertainty; actual fire incidence cannot be predicted. It is dynamic; optimality of current decisions depends on land managers' response to unknown future fire events and, hence, must account for that dependency. Exact optimization methods have been applied to stand-level decisions, such as optimal rotation age under risk of fire. But once spatial interactions are introduced, the problem becomes combinatorial and subject to the so-called "curse of dimensionality." Accounting for a dynamic decision environment with uncertainty further complicates the problem. The problem has been specified as a stochastic dynamic programming problem and solved using complete enumeration. But this required a highly stylized problem formulation, bearing little relation to actual decision situations. Attempts to use simulation models on more realistic landscapes have incorporated spatial relations using heuristic search algorithms, but have ignored the dynamic aspect of the problem. No studies that we are aware of explore the question of when it is optimal to allow a wildfire to burn. This presentation describes our current effort to frame the problem of optimal fire and fuels management in the context of reinforcement learning, also known as approximate dynamic programming. The approach uses Monte Carlo methods to simulate potential future fire events and it uses regression or other machine learning methods to "learn" optimal management policies. We are currently using the approach to address the question of when to allow a fire to burn and hope to extend it to optimal placement of fuel treatments once the basic framework is in place.

Moreno, José M.

I am currently Professor of Ecology and Chair at the Department of Environmental Sciences, University of Castilla-La Mancha, Toledo, Spain. I am also Vice-Chair of Working Group II of the IPCC, and member of its Bureau.

Oral presentation, Thursday, 4:15 PM, B118

Challenges for managing forest fires in the Mediterranean under changing human and climate conditions

Mediterranean landscapes have been intensively used since millennia. Few areas, if any at all, have escaped human alteration. In the recent decades, many unproductive lands have been abandoned or forested, leading to increased forest land. Additional recent trends include increased urbanization of wildlands and area devoted to conservation purposes. Fire

danger conditions have been increasing as well. Fire policies in the region aim at totally excluding fire. With larger areas accumulating more fuel, and increased recreation pressures, together with increasing fire danger conditions, fire risk should increase. Despite this, while the number of fires has increased, burned area has remained stable or decreased, due to the development of a large fire-fighting capacity. If, in general, there is no trend for the number of very large fires, megafire events (i.e., multiple very large fires occurring simultaneously), have occurred, funneled by most extreme weather conditions under which firefighting is less efficient. Nevertheless, similar extreme conditions in neighboring countries have not resulted in similar megafire events, which reflect the role of people in fire. While conservation areas have increased to sizable portions in some countries, fire ecology is virtually ignored in conservation plans. In looking towards the future, virtually all climate models project changes in climate that could result in most significant increase in fire danger conditions. Increased in heat waves and droughts for the region are most relevant. Droughts can result in significant plant die back, as documented in recent events, further increasing landscape hazard. Droughts can also affect postfire regeneration, so that that vegetation shifts following fire could occur. The need to revise current policies and practices will be discussed in the light of the new projections.

Morgan, Penny

Penny Morgan is Professor and AFE Certified Senior Fire Ecologist. She is lead of the Wildland Fire Program at the University of Idaho.

Oral presentation, Tuesday, 3:50 PM, C120

Plant response to postfire mulch and seeding treatments one to six years after the 2005 School Fire

Mulch treatments are increasingly applied post-fire to limit erosion and weed establishment, yet the effects on vegetation recovery are poorly understood. Four years after the 2005 School Fire in Washington, understory plant species diversity and composition, carbon:nitrogen (C:N) in soils, and nitrate uptake by vegetation differed for wood straw, wheat straw, hydromulch, native grass seeding, and control treatments applied on steep, severely burned sites. Areas with wood straw treatment had low cover of grasses and forbs but many shrubs, while areas of wheat straw mulch had low cover of grasses but more forbs and shrubs. Areas seeded with native grasses had abundant grass resulting in low forbs and shrubs, and hydromulch treatments had the greatest species richness and diversity. Although plant communities differed more in post-fire years 2, 3, and 4 than in years 1 and 6, the differences will likely persist for decades. Drawing upon this study with measurements one, two, three, four and six years after treatment, we discuss potential causes. Mulch provides an abundance of carbon to feed microbial decomposition but comparatively little nitrogen, which can increase demand for nitrogen by soil microbes leading to immobilization of soil nitrogen. Mulch also provides a physical barrier to plant establishment and can increase soil moisture and moderate soil temperature. These belowground effects may be tied to observed aboveground traits such as diversity and plant community composition. Drawing upon ours and other studies we discuss the science challenges and implications for post-fire management.

Morrison, Katherine

Katherine Morrison Graduate Student University of Idaho, Department of Geography

Oral presentation, Tuesday, 4:40 PM, C126

Understanding the Role of Wildfire in Land Cover Change in Big Sur, California

The North Pacific nearshore ecosystem includes the coastal zone from Alaska to California that is influenced by both the oceanic and adjacent terrestrial environments. Inputs to the nearshore environment from terrestrial watersheds, such as sediment, nutrients, and pollutants, can have negative effects; in addition, the types of inputs vary significantly across latitude with the intensity of the human footprint. Evaluating landscape changes within these watersheds is vital in addressing potential affects to the nearshore ecosystem. At the southern end of the nearshore range, the Big Sur region of the central California coast is most influenced by humans and is distinct from other coastal watersheds in that it experiences wildfires as the primary cause of landscape change. Wildfire is an integral component of many ecosystems and creates heterogeneous patters with varying levels of severity across landscapes. Understanding the role that wildfire burn severity has in changing landscapes is important in assessing the ways that vegetation, habitats, and land management could also be altered by potential shifts in fire regimes and is especially important when considering effects occurring in coupled ecosystems. In this research, Landsat satellite data are used to determine that changes in land cover and to measure gradients of severity from wildfires occurring in the region over the last two decades. Remote sensing techniques will be used to determine the role that wildfire and burn severity play in changing the patterns of vegetation communities in the Big Sur region and the potential to effect the nearshore environment.

Moseley, Cassandra

Cassandra Moseley is director of the Ecosystem Workforce Program and Institute for a Sustainable Environment at University of Oregon. At UO, she developed research and policy programs focused on federal forest management and sustainable rural development. She is co-editor of People, Fire, and Forests: A Synthesis of Wildfire Social Science (2007) and numerous social science reports and articles related to wildfire. She co-investigator of the Northwest Fire Science Consortium and chair elect of the USDA's Forestry Research Advisory Council. She has testified before Congress about federal forest management, green jobs, and forest workers. She received her Ph.D. from Yale University and her B.A. from Cornell University.

Oral presentation, Wednesday, 11:00 AM, C122

Economic Effects of Large Fires on Local Labor Markets in the American West

Large wildfires disrupt the lives of families, workers, and employers. However, wildfire efforts may also provide economic opportunities through fire suppression and recovery efforts. Understanding the impacts of large fires can help policy makers, resource and fire managers, and community leaders anticipate and plan for the challenges and opportunities that wildland fire present. Labor markets may experience positive effects from the economic activity generated through fire suppression or recovery and negative effects from the disruption of daily life and regular businesses in sectors like natural resource management, tourism, and supporting industries. Using Bureau of Labor Statistics data, we compared the labor market trends in of a panel of western US counties from 2004 to 2008 to identify differences in employment and wages in those counties that experienced wildfire (n=150) from those that did not (n=264). Our findings suggest that large wildfires have a variety of economic impacts on labor markets, generally increasing the instability in the labor market during and after a wildfire. A key predictor of labor market effects is the percentage of suppression spent locally.

Mowery, Molly

Molly Mowery currently manages the Fire Adapted Communities program within the National Fire Protection Association's Wildland Fire Operations Division. She also coordinates other division initiatives, such as wildland fire regulation studies and international outreach. Prior experience includes advising communities and government agencies throughout the U.S. and internationally on hazard mitigation, sustainable development, and land use planning. Ms. Mowery holds a Bachelor of Arts from Naropa University and a Master in City Planning from the Massachusetts Institute of Technology.

Oral presentation, Wednesday, 2:30 PM, B111

Creating Fire Adapted Communities

Fire Adapted Communities is a national effort that promotes engagement by homeowners, firefighters, civic leaders, and land managers to reduce wildfire risk in communities throughout the United States. This initiative is supported by the USDA Forest Service, National Fire Protection Association, and a coalition of leading wildfire agencies.   Fire adapted actions address resident safety, homes, neighborhoods, businesses and infrastructure, forests, parks, open spaces, and other community assets. Tools and programs include the Firewise Communities/USA program, Ready, Set, Go!, Community Wildfire Protection Plans, as well as concepts such as fuel management practices, prevention and education, community safety zones, and more. A new website and ad campaign promote these resources at fireadapted.org.   Success, however, ultimately relies on local implementation. In addition to showcasing the concepts behind Fire Adapted Communities, this session will highlight how one community – Rapid City, South Dakota – has addressed their wildfire situation. Rapid City has taken a number of steps toward becoming fire adapted under their Survivable Space Initiative. This initiative is designed to promote everyone's role in reducing wildfire, and empowers and builds trust within their wildland-urban interface community. Efforts include fuel reduction projects, community education and outreach, volunteer firefighting survivable space training in Rapid City and surrounding communities, and combustible building material replacement. A recent fire tested the success of this effort, and underscores the importance of a comprehensive approach toward community preparedness.

Mustaphi, Colin Courtney

Colin Courtney Mustaphi is interested in studying Holoceneenvironmental variability through the use of proxy records established byanalysing lake sediment stratigraphies. An understanding of landscape ontogenyand historical biogeography is achieved by reconstructing and interpreting pastenvironmental variability through the use of sedimentological andpaleoecological techniques.

Oral presentation, Tuesday, 4:40 PM, B113

Multiple lake sediment records of Holocene forest fire histories from southeastern British Columbia, Canada

Understanding climate-fire-vegetation interactions at local and regional scales is important for sustainable forest management and conservation. The ecological importance of natural fire regimes has been increasingly realised and incorporated into conservation and management strategies (American Healthy Forests Initiative, 2003; Canadian Wildland Fire Strategy Declaration, 2005). Paleoecological records of forest vegetation assemblages and historic fire regimes can be used to inform these management decisions.   At the wildland-urban interface, fire poses an immediate threat to life, health, infrastructure, accessibility, and economy. In most years, forest fires are a threat to many communities of the Columbia Mountains of British Columbia, affecting tourism, air/water quality, fire-fighting costs, and damaging commercially-important forests. In order to better understand current and future forest fire regimes, long-term records of fire events need to be investigated. Charcoal is deposited into the sedimentary record after a fire event, and lake sediments provide an important archive of this natural history. Macroscopic charcoal (>150 μm diameter) is deposited into a lake after a fire occurs locally within the watershed, and analyses from multiple lakes are used to build regional fire histories.   Here, we present the results of macroscopic charcoal analysis from 3 lake sites at different elevations within the Columbia Mountains, near Nelson, British Columbia. The sediment archives provided forest fire histories covering the past 10,000 years, and show that fire is slightly more frequent at mid-elevation sites than high-elevation forests. Significant synchroneity of fire events was found at multi-centennial scales between sites sharing south-facing or north-facing aspects. This suggests that long term regional climate acts as a top-down control on fire regimes in Engelmann spruce-subalpine fir forests of the Kootenay region.

Nichols, Tom

Tom Nichols, Chief, Fire and Aviation Management, National Park Service. As far as I'm aware, I'm the only person who's been a park Fire Management Officer, a NPS Regional Fire Management Officer, as well as a NPS national Fire Management Officer.

Plenary talk, Friday, 10:45 AM, Ballroom

Yet another version of federal fire policy: does it matter?

The National Park Service has used fire to achieve multiple objectives since the 1960's. There are pro's and con's about having separate categories of fire (prescribed natural fire/fire for resource benefits vs. wildfire) or one only one category, wildfire, which may have multiple objectives. The issue isn't really what we call fire in policy as much as our willingness, or reluctance, to use fire to achieve resource objectives, regardless of the flexibiility fire policy may give us. After approximately 40 years of effort, it is worth evaluating the success of the NPS fire program in the restoration or maintenance of fire dependent ecosytems, and think about what difference, if any, the current fire policy will make in the pursuit of the NPS mission.

Nicolet, Tessa

Tessa Nicolet is a Regional Fire Ecologist with the U.S. Forest Service, Southwestern Region stationed in Payson, Arizona. She has been involved with fire ecology and fire management in the southwestern region since 2005.

Oral presentation, Wednesday, 1:15 PM, C121

Fire legacy's role in current and future fire management in the Southwestern United States

The southwestern United States encompasses many ecosystems with intimate and inseparable relationships with fire. It is well accepted that fire plays an integral role in the ecology and maintenance of many forest and grassland types in the southwest. Fire on these landscapes not only shapes how those systems function but long-term fire effects provide for current and future interactions with fire. Focusing specifically on past fire occurrences and how current fires interact with these areas, we provide an overview of management opportunities, fire severity and overall interactions. Burn severities within vegetation types are compared for areas that have experienced documented recent fires versus those area that have not. Suppression and management strategies are also examined based on these past fire legacies on ten of the largest fires from the 2012 and 2011 fire seasons. Fire effects from past fires that are evident in current live and dead fuels conditions increase the decision space for suppression and management strategies and tactics. Results illustrate the importance of fire on these ecosystems not only from an ecological perspective but in the form of opportunities and choices for future fire management.

Norman, Steven

Steve Norman is a research ecologist with the USDA Eastern Forest Environmental Threat Assessment Center where he is engaged with diverse risk assessment efforts that mostly relate to wildland fire and broad ecological values.

Oral presentation, Thursday, 11:25 AM, B117

Resilient Landscape

Norman, Steven

(See biographical information, above.)

Oral presentation, Thursday, 2:30 PM, B117

Challenges of monitoring outcomes of the Cohesive Strategy: long-term and landscape scale considerations

The Cohesive Strategy identified regional values at risk along with mitigation activities such as fuels and vegetation management, prevention, and community preparedness. Reducing risk is a long-term, iterative, and adaptive process that requires meaningful measures of performance. Simple measures of activity such as acres treated, human wildfire ignition rates, or communities with fire plans are useful, but implementation alone does not imply long-term success or efficiency. Similarly, the effect of a single activity must be evaluated within the context of a suite of activities across the landscape. The challenge for the Cohesive Strategy is to develop a monitoring system that can track success in a complex spatial and temporal context and separate causal effects from the background noise of a stochastic environment. To succeed, performance monitoring needs to be conducted at multiple scales and embedded within a rigorous risk-management framework. In this talk, we illustrate these arguments with datasets that relate to fire behavior, ecological resilience and firefighter safety.

North, Malcolm

Malcolm North is a Research Forest Ecologist with the U.S. Forest Service Pacific Southwest Research Station, and an Affiliate Professor of Forest Ecology, Department of Plant Sciences at the University of California, Davis. He received his Master of Forest Science at Yale University and his PhD in Forest Ecology from the University of Washington. He has worked on research examining the carbon dynamics of fuels treatments and wildfire, and different management practices on forest structure, composition and function. His lab (students and postdoc) primarily focus on forest and fire ecology of Sierra Nevada mixed-conifer forest (http://www.plantsciences.ucdavis.edu/affiliates/north/Malcolm.html).

Oral presentation, Thursday, 1:15 PM, B116

Using Fire to Increase the Scale, Benefits and Future Maintenance of Fuels Treatments

The Forest Service is implementing a new planning rule and starting to revise forest plans for many of the 155 National Forests. In forests that historically had frequent fire regimes, the scale of current fuels reduction treatments has often been too limited to affect fire severity and the Forest Service has predominantly focused on suppression. With less than 20% of the Sierra Nevada's forested landscape receiving needed fuels treatments, and the need to frequently re-treat many areas, the current pattern and scale of fuels reduction is unlikely to ever significantly advance restoration efforts. In addition to continued treatment of the wildland urban interface, increasing the scale of low- and moderate-severity fire would have substantial ecological and economics benefits if implemented soon. One means of changing current practices is to concentrate large-scale fuels reduction efforts and then move treated areas out of fire suppression into fire maintenance. We suggest National Forests identify large contiguous areas to concentrate their fuels reduction efforts, and then turn treated firesheds over to prescribed and managed wildfire for future maintenance. As fuel loads increase, rural home construction expands, and budgets decline, delays in implementation will only make it more difficult to expand the use of managed fire. Without proactively addressing some of these conditions, the status quo will relegate many ecologically important areas (including sensitive species habitat) to continued degradation from either no fire or wildfire burning at high severity. A new round of forest planning provides an opportunity to identify and overcome some of the current cultural, regulatory and institutional barriers to increased fire use that we discuss.

Nuss, Meagan

Meagan L. Nuss is a Graduate Research Assistant at the College of Forestry, Oregon State University. She has presented her work on bioenergy at the IUFRO conference for small-scale forestry, and has recently attended an international training seminar on biomass heat in Upper Austria.

Oral presentation, Wednesday, 2:05 PM, B118

Production attributes of bioenergy as a lens to view project objectives: a case study of forest restoration in eastern Oregon

The implications of bioenergy production are influenced by system characteristics that facilitate project implementation, such as production attributes and local and regional contexts. Production attributes can include such traits as project scale, feedstock requirements, and efficiency. However, little is known about the relationship between such characteristics and a project's ability to address its objectives. The purpose of this research is to explore the bioenergy systems emerging in eastern Oregon by identifying their production attributes, situating them within the ecological, social, and economic context of the region, and examining the objectives that have influenced their implementation. In addition, we link these local developments to larger-scale national and international drivers of bioenergy. Using a case study of Grant County, Oregon to illustrate the relationships between these system characteristics, we reflect on the influence that production attributes in particular have on forest restoration goals. We argue that consideration of project traits such as scale, feedstock requirements, and efficiency, as well as project context, leads to a more accurate understanding of bioenergy developments, their implications, and their ability to meet stated objectives. We gathered data through participant observation, key informant interviews, and secondary data analysis. Elements of participatory research were incorporated during the data collection stage, and will be included during data analysis and dissemination of results.

O'Connor, Christopher

Christopher "Kit" O'Connor is a doctoral candidate in the School of Natural Resources and the Environment at the University of Arizona. Over the summer of 2012 Kit participated in an international consulting project in which he and other collaborators from the University of Arizona helped to implement a study on dendroecology of the Zailiyskiy Alatau Mountains with the Kazakhstan Institute for Plant protection and Quarantine.

Oral presentation, Thursday, 3:25 PM, B113

Anthropogenic shifts in fire regimes and species dynamics along a vertical gradient of the Pinaleño Mountains of Arizona

Fire and climate are important drivers of forest dynamics in western North America. Euro-American settlement during the 19th century and subsequent grazing, logging, and fire suppression altered fire cycles and changed the successional and recruitment dynamics of fire-adapted species. Along the steep vertical gradients of montane forests, changes to fire and species dynamics at lower elevations propagate additional changes to forest structure and fire at higher elevations. In this study we reconstructed fire and species dynamics in ponderosa pine-oak, mixed conifer, and spruce-fir forests above 2,135 msl in the Pinaleño Mountains, the tallest of the Sky Island mountain ranges. We used a gridded design of 78 plots at 500 m spacing to characterize species distributions, tree ages, and spatial and temporal recruitment patterns, and a network of 240 fire-scarred sections to reconstruct fire frequency and size in each forest type. Results suggest distinct patterns of seedling recruitment and differences in fire frequency and severity in adjoining forest types prior to 1900. Post-1900 seedling recruitment shows synchrony across forest assemblages, suggesting a shift from stand-level to landscape level controls, possibly associated with termination of the natural frequency fire regime. Pulses of seedling recruitment and exclusion of fire from lower elevation dry forests have resulted in forest structures that facilitate fire spread among forest types with very different historical fire regimes. Fire-climate relationships showed distinct differences among forest types until ~1900 when fire was almost entirely removed from the landscape. Climate-seedling recruitment relationships showed little synchrony among forest types prior to 1900 but became highly synchronous by the middle of the 20th century. These structural and compositional changes have implications for tree recruitment and longevity, retention of fire-adapted species, and resilience following future disturbances.

O'Connor, Christopher

Christopher "Kit" O'Connor is a doctoral candidate in the School of Natural Resources and the Environment at the University of Arizona. His dissertation work "Disturbance interactions and vegetation dynamics of on an Arizona Sky Island", is the first of its kind to integrate detailed historical reconstructions of forest demography, fire, and insect outbreaks with landscape simulation modeling to examine in detail how disturbance events and climate interact to influence forest species distributions and age structures from century to millennial time scales.

Oral presentation, Tuesday, 2:05 PM, B110

Alternate realities: forest and fire dynamics in a 20th century with and without fire suppression

Fire plays an integral part in shaping the species and stand dynamics of forests across the western United States. Fire regimes vary across gradients of elevation, aspect, and species composition, and are influenced by regional climate trends

and local conditions. In the Pinaleño Mountains of Southeast Arizona, Euro-American settlement in the late 19th century altered previous fire regimes, first through a reduction of available fuels from livestock grazing and logging, and later through active fire suppression. In recent decades fire has returned to the landscape in the form of high-severity crown fire, a type that was rare in the historical record. Severity of recent fires has been attributed to changes in forest structure and species composition over a century of altered fire regimes; however, changing climate and increased density of mature spruce-fir forest may also have contributed to the behavior of the fires.   We used the FireBGCv2 ecological process model to evaluate the role of fire suppression in altering species distributions and forest structure. We modeled changes in species distributions and fuel loading along gradients of elevation under a 20th century climate regime with 1) total fire suppression, 2) partial fire suppression, and 3) no fire suppression. Averaging results from multiple runs for each scenario allowed us to attribute differences in species distributions and fuel loading directly to the level of fire suppression on the landscape. Distinct differences in species distributions, fuel loading, and subsequent risk of crown fire were found among model scenarios, suggesting that changes to fuels in low elevation forests can increase crown fire risk in adjacent higher elevation forests. Results support ongoing fuels reduction efforts in the mixed conifer forest and potential use of prescribed and natural fire to mitigate the risk of future crown fire.

Odion, Dennis

Dennis C. Odion is an ecologist and researcher with Southern Oregon University and the Earth Research Institute at UC Santa Barbara. He has studied spatial patterns of fire and vegetation at a variety of scales, and has published his findings in Ecological Monographs, the Journal of Ecology, and Conservation Biology. His studies highlight the role of spatial heterogeneity in fire in maintaining biodiversity.

Oral presentation, Wednesday, 11:00 AM, B112

A meta-analysis of historic and current mixed-severity fire in the drier forests of western North America

It is widely believed that suppression of low severity fires in drier forests of western North America has led to uncharacteristically severe fires, creating an unprecedented threat to these forests. To address this premise quantitatively, we compiled area-specific, historic rates (fire rotations) of moderate- and high-severity fire at landscape and regional scales from a variety of data sources. We compared these historical rotations with rotations for moderate- and high-severity fire occurrence since the onset of fire suppression, and since 1984, in the drier forests of western North America. We found that historic rotations for moderate- and high-severity fire were broadly consistent with a model of mixed-severity, not the low severity model that is much more widely embraced as characteristic of the drier forests. Regional stand-age data also support the applicability of a mixed-severity historic fire regime model to the drier forests. We also found little support at sub-regional and broader scales for the premise that the drier forests are facing an unprecedented threat due to uncharacteristically severe fire. In fact, the current rotations of moderate- and high-severity fire are generally low compared to those prior to fire suppression. A key management challenge lies with the transfer of information needed to move the public and decision makers from the current perspective that the effects of contemporary mixed-severity fire events are unnatural and harmful to an ecological perspective that recognizes their vital role in maintaining biodiversity and population processes. Such a shift in perspectives, along with shift in fire management to focus more on direct protection of human assets, may expand opportunities to manage fire for ecological benefits.

O'Donnell, Katherine

Katherine O'Donnell, PhD candidate from University of Missouri. Has served in leadership roles for Biology Graduate Student Association and Conservation Biology Program during graduate work at Missouri.

Oral presentation, Wednesday, 3:50 PM, C120

Investigating terrestrial salamander responses to prescribed fire and timber harvest in a Missouri Ozark forest

Prescribed fire and timber harvest are anthropogenic disturbances that can substantially affect forest ecosystems. Timber harvest often causes drying of soil and leaf litter, making forests less capable of supporting amphibian populations. Effects of prescribed fire on wildlife in general, and amphibians specifically, are inadequately understood. Terrestrial salamanders likely play an integral role in nutrient cycling and forest productivity, but may be disproportionately affected by disturbances due to limited movement capacity and moisture dependence. We are investigating the effects of prescribed fire and timber harvest on terrestrial salamanders. In spring and fall 2010-2012, we conducted repeated samples of 20 5-hectare experimental plots at the Sinkin Experimental Forest (Mark Twain NF) in southeast Missouri; plots were harvested in early 2012 or burned in late fall 2012. We performed area-constrained searches, and recorded the size and capture location

of Southern redback salamanders (Plethodon serratus). Terrestrial salamanders have notoriously low detectability; thus, we used program unmarked to fit hierarchical models of abundance with imperfect detection. We caught 1883 redback salamanders through fall 2011. Average captures per 9m2 plot ranged from 1.6 (fall 2011) to 2.9 (fall 2010). Most salamanders (75%) were found within leaf litter; the rest were under rocks (11.4%) or woody cover (13.6%). Approximately 63% of the variation in captures-per-plot was explained by time elapsed since rain. Before treatments, the strongest predictors of detection probability were rainfall and woody cover abundance; slope and aspect best predicted salamander abundance. Our results illustrate the importance of accounting for imperfect detection when sampling wildlife. Including leaf litter in area-constrained searches will enable detection of changes in salamander microhabitat preference post-fire. Understanding responses of amphibians to prescribed fire is important for developing more effective forest management plans; our results will enhance our ability to protect forest biodiversity and improve wildlife habitat.

Olsen, Christine

Christine Shaw Olsen, Ph.D., is a Research Social Scientist and Instructor in the Department of Forest Ecosystems & Society at Oregon State University in Corvallis, Oregon. Dr. Olsen is co-investigator of the Northwest Fire Science Consortium and conducts research on citizen-agency interactions, public opinions about fire and fuel reduction activities, and communication and education about forestry and fire. Her most recent projects examine public perceptions of smoke from prescribed fire, citizen-agency trust, and coupled human-natural systems in fire-prone landscapes. Dr. Olsen teaches classes about forest management for multiple resource values, managing in the wildland-urban interface, sustainable natural resource management, and social science methods.

Oral presentation, Wednesday, 11:00 AM, B117

Fire science users in the U.S. Pacific Northwest: A diverse and dynamic bunch

The call to use sound science in natural resource decision-making has been increasingly heard over the last several decades. Population growth in fire-prone landscapes, climate change, and diverse land management objectives all contribute to a complex management environment in fire-prone landscapes. The number and types of managers and practitioners involved in wildfire management has also grown, as have their fire science and social science needs to make appropriate management choices. To protect and restore fire-adapted communities and natural resources across the United States, a process for effective dissemination and accelerated user adoption of pertinent scientific information, knowledge, tools, and expertise is necessary. Recognizing this need, the Joint Fire Science Program funded regionally-based science needs assessment projects, which then inform the development of regionally-appropriate fire science information exchange consortia. In the U.S. Pacific Northwest, there are several existing fire science delivery methods, yet uncertainty exists as to whether managers and practitioners consistently use these resources, or if the growing, diverse set of current fire science users can access them. It is not clear if research is developed and disseminated in ways that are accessible and useful for diverse stakeholders and land managers. To build a consortium that can serve the diversity of fire science needs in the Pacific Northwest, we conducted an assessment of fire science users and their perspectives. In this presentation, we report on the findings of seventy-four interviews conducted with a wide variety of science end-users in Oregon and Washington, as well as implications for the development of a Northwest Fire Science Consortium.

Olsen, Christine

(See biographical information, above.)

Oral presentation, Wednesday, 3:50 PM, B118

Communicating about smoke: public opinions about information sources and sufficiency

Smoke from wild and prescribed fires affects air quality regardless of boundaries and often at great distances, making it a major concern for many communities in diverse eco-regions. Fire-related research has grown tremendously in the last decade, yet smoke-related research has grown less rapidly, particularly in the social sciences. While acceptability of smoke can influence the use of prescribed fire as a management tool, to date only a few social science studies have specifically targeted research questions related to smoke. Findings presented here come from an ongoing Joint Fire Science Program funded project that examines citizen tolerance for and acceptance of smoke and communication methods between managing agencies and their publics, with a focus on different types of communication programs (e.g., media announcements, on-site bulletin boards, collaborative planning projects) and the presence of fire-related citizen-agency partnerships. This presentation will describe survey findings from fire-prone communities in south-central Oregon, northern California, northwestern Montana, and central coast South Carolina. Surveys were conducted in 2012 following site visits and interviews at

each location. Findings discussed here will examine citizen experience with different outreach strategies, perceptions about seeking additional smoke information and the reliability of potential information sources, and opportunities for targeting groups for future communication programs. The presentation will conclude with a discussion of management implications.

Oram, Gary

As a Masters candidate at the University of Montana, Gary Oram is working in wildland fire, and with alternate sources of energy, A Firefighter Type 1. Performing initial, and extended attack, via helicopter and ground transport on Size Class A and B fires, he has personally been involved in suppressing over 50 wildland fires. He is organizing Symposium Four " Preventing Catastrophic Losses to the Cascading Effects of Forest Fire" in Washington D.C. January 15, 2013, during the 13th Annual Conference on Science, Policy and the Environment. http://www.environmentaldisasters.net/topics/view/81484/

Oral presentation, Wednesday, 4:15 PM, B111

Using the Carbon Cycle to Inhibit Global Warming: The economic and environmental benefits to burning forest biomass

A fifteen minute Oral presentation on the economic and environmental benefits of burning forestry biomass.   Global Warming is not debatable, as the anthropogenic cause is becoming widely accepted. What is not accepted, everything that biologically grows above ground level will eventually add parts-per-million to the particulate levels of the atmosphere. Put a kettle of water on the kitchen range, turn the range on high and soon the water boils out. At the evaporation point it takes whatever particulates in it, with it, and both rise into the sky. Set that same kettle of water in the window seal, and over time the water evaporates. Occurring under the same law of physics, any particulate matter in the water also rises into the atmosphere. A biomass, just like the kettle of water, whether it burns or whether it is left to rot and decompose naturally in the forest, will eventually eject its particulate matter into the air we breathe.   We have understood the results of altering forest mosaics for our benefit since the end of the great holocaust fires in Michigan, and Wisconsin in the late 1880's and early 1900's. We know how to manipulate forest structure to aid fire. We know how to manipulate forest structure to inhibit fire. We know that no matter what we do, lightening is still going to ignite fire in the remote and not-so remote areas. We know that there is too much burnable material in the forests. We know we can generate electricity by burning forest product without releasing as much CO_2 as natural gas. We also know that this industry would create jobs while helping the environment

Osunmadewa, Babatunde

I am Osunmadewa .B.Adeniyi, PhD research student at the University of Technology Dresden, Germany. I am a young researcher in the area of Remote Sensing for environmental monitoring and had attend and presented papers on: 1. Earth observation for global change, Munich, Germany April 13 - 15, 2011 (Earth Observation for Natural Hazards Monitoring and Assessment: The example of Sokoto State, Nigeria) 2. Tropentag 2011. University of Bonn, October 5 - 7, 2011 (Remote Sensing and GIS for Assessing Land Use Land Cover Change: A Case Study of Jos and environs, Plateau State Nigeria) published as proceedings   The subsequent papers to be presented this year are: 3.Tropentag 2012: September 19 - 21, 2012, Göttingen - Kassel/Witzenhausen (Investigation of Agroforestry Practices within Eucalyptus camaldulensis Plantations: A Case Study of Kaduna State Forest Management Project, Buruku, Nigeria)   4.Tropentag 2012: September 19 - 21, 2012, Göttingen - Kassel/Witzenhausen (Assessing Variations in Land Use Land Cover of Kassala State, Eastern Sudan Using Multi-temporal Landsat Imagery)

Oral presentation, Thursday, 2:05 PM, C125

Mapping of fire severity in dry ever green Afromontane forests of Ethiopia using Landsat data .

Fire is one of the ecological factors contributing to forest landscape variations in tropical countries. Depending on its intensity, interval and duration, fire can affect structure and composition of forest ecosystems. Asebot forest, one of the few ever remaining dry Afromontane forests in the eastern escarpment of Ethiopia and home to one of the age-old Ethiopian Orthodox Church Monastery has experienced major fire events in 2000, 2008 and 2012. Mapping of fire severity is crucial in put to develop and implement proper fire management plan. Several studies have used satellite data to map different levels of existing fire severity within burned areas. We used multi-temporal Landsat TM 2000, ETM+ 2008 and ETM+ 2012 imagery to produce maps of burned areas and indentify fire severity. Fire severity is estimated from normalized burn ratio (NBR), a spectral band ratio transformation of bands 4 and 7. The near infrared and short wave infrared bands show the best contrast between unburned vegetation and burned vegetation. The raw data of band 4 and 7 transformed to Radiance and "at-satellite" Reflectance to produce NBR maps. NBR were computed for a pre-fire scene and a post-fire scene of 2000, 2008 and 2012 and then subtracted to result in the differenced normalized burn ratio (dNBR). The variations in dNBR

within the burn area are related to variations in burn severity. An estimated 4,046 ha, 12,433 ha and 4,481ha in 2000, 2008 and 2012 respectively were burned with sever burn occurred in 2008.The recurrent fire has consumed seedlings, saplings and old trees to affect the structure and composition of Asebot forest. Results of this study will help in sensitizing national, regional and local level responsibilities to sustainably manage the remaining forest resources of the country.

Oswald, Brian

Brian Oswald. Regents Professor, Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University. Current President of AFE.

Oral presentation, Thursday, 2:05 PM, C126

Fire Research at SFA: A recap of the last 16 years

A wide variety of wildland fire research has been performed in the Arthur Temple College of Forestry and Agriculture at Stephen F. Austin State University since 1997. This presentation provides a summary of that research, predominantly that performed by Graduate Students in the Forestry or Environmental Science MS programs.

Ottmar, Roger

Roger D. Ottmar Research Forester US Forest Service, Pacific Northwest Research Station   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. Roger leads efforts to develop 1) a natural fuels photo series; 2) Consume, a model to predict fuel consumption and emission production by combustion phase for forested and non-forested fuel types across North America; and 3) the Fuel Characteristic Classification System to build and characterize fuelbeds for the United States and the world.   He consults on the assessment of wildland firefighter exposure to smoke and the associated health risks.   He also leads the RxCADRE, individual researchers and research teams from across the United States that collaboratively instrument and collect data to characterize fire-atmospheric dynamics during prescribed fires.

Oral presentation, Thursday, 11:00 AM, C122

A Data Set for Fire and Smoke Model Development and Evaluation—RxCADRE Project Progress

An integrated, quality-assured fuels, atmospheric, fire behavior, fire mapping, smoke and fire effects data set is needed for development and evaluation of fire and smoke models because existing data sets are limited in scope and hinder our ability to tackle fundamental fire science questions. To begin the collection of such a data set, a group of over 20 scientists pooled their operational in-kind resources and collaboratively gathered fire and fuels data on prescribed fires in the southeastern United States in 2008 and 2011. This effort was called the Prescribed Fire and Combustion and Atmospheric Dynamics Research Experiment (RxCADRE). In 2012, the Joint Fire Science Program funded improvement and continuation of the RxCADRE effort, focusing on integrated fine-scale and operational-scale scientific measurements within 6 identified core fire science disciplines: (1) fuels, (2) meteorology, (3) surface fire behavior, (4) event-scale fire mapping, (5) smoke, and (6) fire effects. The project focused on meeting certain critical data needs as outlined by members of the fire modeling community. The RxCADRE effort collected data on six rapidly and uniformly ignited replicated burn blocks (100m X 200m) and 2 operational scale burn blocks (400 ha) during the fall of 2012 at Eglin Air Force Base, Florida. The major fuel type was grass, with a minor component of shrubs, although half of one large block was dominated by a managed southern pine forest. When completed, this larger, more coordinated and robust RxCADRE research effort will provide a high quality, integrated fire data set for model testing and evaluation. This presentation offers an overview and progress of the project with some preliminary results from the effort and insight into collaborative scientific approaches towards a more quantitative understanding of fire behavior and data management.

Ottmar, Roger

(See biographical information, above.)

Oral presentation, Thursday, 1:15 PM, B110

Characterizing fuels for Fire and Fuels Management Application in the 21st Century

Fuels are often defined based on the physical characteristics of live and dead biomass that contribute to wildland fire. Because these characteristics affect the character, size, intensity, and duration of fires, fuels are important to the understand-

ing of fire behavior and effects by providing information for activities such as prescribed fire, fire suppression, and fuel treatments, assessment of wildlife habitat and quantification of carbon stores. Furthermore, fuel characteristics are important inputs into increasingly sophisticated and complex fire and smoke models available to land managers. Over the past 13 years, great strides have been made in both measurement techniques and elemental characterization of fuels. This has led to the development or improvement of tools such as the photo series, FIREMON, Fuel Loading Models and the Fuel Characteristic Classification System. During the 1999 Joint Fire Science Program's fire management conference entitled "Crossing the Millennium: Integrating Spatial Technologies and Ecological Principals for a New Age in Fire Management, it was suggested a more integrated and systematic national approach to fuels mapping was needed. A critical component of this quest was the measurement and characterization of the "fuelbed" that accounts for all biomass that has the potential to consume during wildland fires. This presentation will review the past and present state of knowledge, what is currently on going, what is left to do in measuring and characterizing fuels.

Padgett, Pamela

Pamela Padgett, Research Plant Biologist, US Forest Service, Pacific Southwest Research, Riverside CA The work that I will be presenting was the result of a uniquely successful collaboration among seven agencies charged with fire prevention, response, and research. Each agency brought a critical component of the study to the table so that in the end the costs were minimal, and all entities had immediate access to the results and a stake in the final product. We are believe that this collaborative approach was as important to the success of the project as was the resulting data and products.

Oral presentation, Tuesday, 4:15 PM, B116

Ignition and rates of fire spread of chipped woody material

In 2006 during the Esperanza fire a dozer operator took shelter in a recently masticated fuels treatment area thinking that the area was a safe haven from the oncoming fire. The operator survived, the dozer did not. Early, during the Santiago fire, flaming brands showered a plant nursery where all the paths were lined with wood chips and mulch. Predictions of the outcome were for extensive destruction. The predictions were wrong; most of the ignitions flame out within a foot of the landing site. Conflicting and counter intuitive information about the flammability characteristics of chipped woody material have made it difficult to establish best management practices for fuels treatments in the semi-arid regions of Southern California. Using an interagency and cross disciplinary team of scientists, fire fighters, and fuels treatment managers we set out to understand and establish the ignition characteristics of post treatment fuels, typical of Southern California. The approach was to evaluate fire behavior of a variety of hardwood, softwood, and composted chipped material under controlled laboratory conditions and then replicate those experiments under field conditions. In addition to source material, particle size, fuel bed depth, fuel moisture, and ambient temperature and relative humidity were evaluated. The age of the material was also investigated. The results indicated that age of the chips and moisture content were the primary factors, but source material, and fuel bed depth also influenced ignition and fire spread. Details and implications for fuels management practices will be presented.

Park, Jane

Jane currently works as the Fire and Vegetation Specialist in Banff National Park, based in Banff, Alberta, Canada. Jane graduated with a B.Sc. from the University of Winnipeg before completing her M.Sc. at the University of Calgary. Her career with Parks Canada has allowed her to work in a very active prescribed fire program and as well as in the Yukon arctic and the Queen Charlotte Islands of British Columbia. Her research within Parks Canada has focused on prescribed fire effects on douglas-fir ecosystems, mountain pine beetle population dynamics, fuel distributions and prescribed fire effects on grizzly bear habitat.

Oral presentation, Thursday, 3:50 PM, B111

Integrating Fire Science into Ecosystem Management in Banff National Park, Banff, Alberta, Canada

The history of prescribed fire in Banff National Park can perhaps be traced back to first nation's burning of valley bottoms to increase foraging habitat for game such as bison, elk and deer. Following nearly a century of fire suppression, Parks Canada began implementing prescribed fire in Banff National Park in 1983 with a small prescribed fire near Two Jack Lake. Since then Parks Canada's prescribed fire program has evolved to include landscape level implementation of fire, large-scale fuel modification to facilitate large prescribed fires, and complex inter-agency operations. Furthermore, the prescribed fire program in Parks Canada is multi-disciplinary and aims to meet multiple ecological objectives. Restoring historic fire cycles and vegetation complexes, improving wildlife habitat, improving forest resilience to forest insects and disease, mini-

mizing threat of wildfire to communities and conducting fire effects monitoring and research are all critical components of the program. I will be providing history and context to the current Parks Canada prescribed fire program and highlighting recent prescribed fire and research initiatives that demonstrate the balance between operational and ecological management of fire in Canada's National Parks, using Banff National Park as an example.

Parks, Sean

Sean is a landscape fire ecologist for the Aldo Leopold Wilderness Research Institute in Missoula, MT. He heavily relies on GIS, simulation models, satellite imagery, and multivariate statistics to conduct his work investigating the relationship between landscape-scale fire patterns and topography, climate, and vegetation in wilderness areas and elsewhere.

Oral presentation, Tuesday, 2:05 PM, C125

A viable new method for mapping fine-scale day-of-burning with coarse-scale MODIS fire detection data

Fire progression maps are generated to provide fire managers and the public with information on how a particular wildfire has grown over time. While fire researchers are starting to use these maps to understand variability in fire behavior and effects, the fire progression data are often inconsistent because flight times vary by day, multiple-day gaps often exist, and some fires are not mapped due to limited resources (i.e., no available aircraft) or their remoteness from values at risk. To resolve these inconsistencies, we developed a method for generating daily fire progression maps from relatively coarse-scale Moderate Resolution Imaging Spectroradiometer (MODIS) fire detection points. This novel approach estimates the day-of-burning for each 30m pixel within a fire perimeter, thereby generating consistent spatial data depicting daily progression for any fire occurring 2002 to present (the temporal extent of MODIS imagery). To test our method, we analyzed ~20 fires representing different geographic regions of the western U.S. that had independently generated fire progression maps (e.g., aerial thermal infrared mapping). We used the aerially mapped fire progression data to validate the day-of-burning estimates from MODIS and found they corresponded quite well. This new method provides unbiased and consistent estimates of fire progression, which will more easily allow managers and researchers to analyze how variability in fire behavior relates to variability in weather and fuel moisture conditions. For example, knowing the exact day that each pixel burned will provide the fire community the ability to explore the effect of daily ERC or wind speed (obtained from a nearby RAWS station) on burn severity (dNBR) or fire spread rates.

Parmenter, Robert

Bob Parmenter is the Director of the Scientific Services Division for the USDA's Valles Caldera National Preserve in northern New Mexico, and is responsible for organizing and coordinating the scientific research, inventory and monitoring programs on the Valles Caldera National Preserve. These programs include long term studies in meteorology, hydrology, geology, forest and grassland restoration and management, wildlife and fisheries ecology, fire ecology and management, biodiversity, and archaeology. He is a member of the Valles Caldera Trust's management team, which has the advantage of "placing science at the table" during strategic and programmatic planning and decision-making.

Oral presentation, Tuesday, 1:15 PM, C120

Resiliency of natural resources following the 2011 Las Conchas Fire in New Mexico: Short-term impacts and recovery of aquatic and terrestrial vegetation and wildlife.

The Las Conchas Fire during June-August, 2011, burned over 63,000 ha of forest and grassland in the Jemez Mountains of northern New Mexico. At the top of the burned watersheds, the fire covered over 12,000 ha (34%) of the 36,000-ha Valles Caldera National Preserve. While large-scale uncharacteristic wildfires are increasing in North America, few areas that burn in these fires have pre-existing ecological monitoring sites that can evaluate fire impacts on ecosystem structure and functioning. The Valles Caldera National Preserve is an exception, where existing monitoring programs for climate, hydrology, water quality, vegetation and wildlife/fisheries provided extensive data on pre-fire ecosystem variables. Instruments deployed for weather stations, stream discharge flumes and gauges, and water quality monitors (Sondes) recorded events continuously throughout and following the fire, and because only a third of the Preserve burned, vegetation and wildlife monitoring sites recorded fire impacts in both burned and unburned areas. Additional post-fire monitoring sites for vegetation, fish and wildlife (including terrestrial and aquatic invertebrates) were established immediately after the fire. Post-fire monitoring for terrestrial vegetation, terrestrial and aquatic invertebrates, fisheries, and the Jemez Mountains elk herd, revealed highly variable patterns across taxa of survival, recovery and recolonization in the first year after the fire. Streams subjected to flash floods exhibited high ammonia and turbidity spikes, depressed dissolved oxygen, and elevated pH values, contributing to the near-annihilation of introduced brown and rainbow trout – but aquatic invertebrates and

native non-game fish species were only slightly affected. With the onset of the monsoon rains, herbaceous vegetation diversity, species richness and cover recovered quickly in the first post-fire growing season. Terrestrial wildlife (mammals, birds) and arthropods were temporarily affected, but recovery was proceeding quickly through 2011-2012. The Preserve's long-term monitoring program provides managers with detailed information on post-fire recovery rates of these important ecosystem components.

Parsons, Russ

Russ Parsons is a Research Ecologist for the Fire, Fuel and Smoke Program. Russ received his B.S. in Forestry from the University of California, Berkeley, his M.S. in Forestry from the University of Idaho, and his Ph.D. in Forestry from the University of Montana. He has worked in fire and resource management under several agencies, including the California Department of Forestry, Sequoia and Kings Canyon National Park and the Peace Corps. Since 2000, Russ has worked at the Fire Sciences Lab, specializing in simulation modeling and spatial analysis. His current research integrates field work, laboratory experiments and simulation modeling to quantify fuel characteristics and improve our understanding of how fuels influence fire behavior.

Oral presentation, Tuesday, 4:40 PM, C122

Development of detailed fuels maps for fire behavior analysis via imputation of FIA plot data

Maps representing different attributes characterizing forest structure and composition are critical inputs in analysis and planning for numerous aspects of both ecosystem analysis and fire and fuels management. While managers have benefitted from the spatially comprehensive and methodologically consistent wall-to-wall spatial data layers produced by LAND-FIRE, there are situations where greater detail is needed than is provided by current LANDFIRE data products. Conversely, while more detailed data can be developed for specific areas through various approaches, often combining local sampling with remote sensing data,such detailed data are typically only available for small areas. Managers and researchers are thus confronted with a choice between consistency and detail.   Here, we describe a new approach for developing fuels maps that provides a compromise between these two extremes, and with the benefit of broad spatial coverage as well as detailed fuel representation. This approach, called a "tree list layer" depicts tree populations and stand structure explicitly. The tree list layer is composed of a thematic raster map in which each 30-meter pixel is assigned a tree list identifier, along with a lookup table of tree data from field measured plots. Production of the tree list layer involves post-processing the existing classified LANDSAT (LANDFIRE vegetation type, canopy cover, canopy height) by nearest neighbor imputation within specific landscape strata. The tree list layer serves a key need in providing a more detailed characterization of canopy fuel structure than is available with standard LANDFIRE products, facilitating new applications and research in fire behavior and fire effects simulation.

Parsons, Russ

(See biographical information, above.)

Oral presentation, Tuesday, 11:25 AM, B115

Modeling interactions of beetle attacks and fire behavior over time in lodgepole pine stands using FIRETEC

Understanding how mountain pine beetle (MPB) outbreaks may affect fire behavior is important in order to evaluate potential implications for fire-fighter safety, fuels management, and fire effects. At present, however, the impacts of such infestations on fire behavior are poorly understood. The effects of MPB attacks on fire likely change over time; early in the attack, potential increases in flammability may arise from dead tree crowns, while later in time, canopy fuel continuity may decrease as dead foliage falls to the forest floor. Additional influences include heterogeneity in the antecedent stand structure, the nature of the beetle attack as it unfolds in time in space, and the atmospheric and live and dead vegetation conditions at the time of the fire.   Here, we combine a spatially-explicit model of beetle attack within a stand with a coupled atmosphere/ fire behavior model, FIRETEC, to examine the impacts of a MPB outbreaks on lodgepole pine forests over time with different ambient wind speeds. Our results indicate that coupled fire/vegetation/atmosphere interactions dictate the nature of the fire behavior and that both local canopy-fuel conditions and stand structure changes must be considered. Stand structural changes modify wind flows as well as turbulent mixing. Depending on the nature of the outbreak, different fire/atmosphere couplings can emerge. Changes in fire behavior also modify the wind fields around the fire, which subsequently feed back on the fire behavior.   These results suggest that the impacts of MPB outbreaks may include periods of accelerated/intensified as well as decelerated/ weakened fire behavior.

Paschke, Mark

Mark Paschke is an Associate Professor and the Shell Endowed Chair of Restoration Ecology in the Department of Forest and Rangeland Stewardship in the Warner College of Natural Resources at Colorado State University. He also serves as the Research Associate Dean for the Warner College. He received his PhD in Biology from the University of Illinois at Urbana-Champaign in 1993. He also has B.S. and M.S. degrees in Forestry from the University of Illinois. His research focuses on the mechanisms controlling community assembly in terrestrial plant communities. He currently teaches classes in Restoration Ecology, Ecological Restoration, Reconciliation Ecology and Disturbance Ecology.

Oral presentation, Tuesday, 1:15 PM, B117

Utilization of "native weeds" for post-fire restoration

Recent increases in fire frequencies and sizes in the western US have created an interest in improved post-fire rehabilitation treatments. Unfortunately, post-fire seeding operations have often failed or backfired causing many managers to rethink post-fire seeding altogether. Traditional rehabilitation seed mixtures of perennial mid- to late-seral grass species may not be suitable for intensely burned sites that have been returned to an early-seral condition and thus may explain some seeding failures. Under disturbance conditions, native annual weedy plant species are likely to be more successful at establishing and competing with exotic annual plant species such as Bromus tectorum L. In a series of field, greenhouse and lab studies we have explored the utility of native weedy species for seeding of disturbed lands. Results suggest that there is potential for these native weeds to be effective for restoring post-fire habitats. Field results show that native weeds may facilitate the establishment of native perennial species while suppressing the growth of exotic weeds like Bromus tectorum. We have identified feedbacks with soil mycorrhizal communities as a possible driver of these observations. However, numerous challenges remain in using native weeds for large-scale post-fire restoration efforts.

Pelz, Kristen

Kristen Pelz is a PhD student in Forest and Rangeland Stewardship and the Graduate Degree Program in Ecology at Colorado State University. Kristen received her B.A. in Environmental Studies and Geography from Middlebury College in 2006 and a M.S. in Forest Science from CSU in 2011. She is generally interested in the effects of forest disturbances, including fire and insect outbreaks, on forest structure, composition and spatial pattern, and how we can best emulate these disturbances with forest management.

Oral presentation, Tuesday, 2:05 PM, C126

One size does not fit all: Modeling the interacting effects of forest composition and management on fuel complex and predicted fire behavior in the century following a mountain pine beetle outbreak

Mortality caused by mountain pine beetle (MPB) in lodgepole pine forests will have a long-term effect on forest fuel complex and future fire behavior. However, lodgepole pine-dominated forests affected by MPB are heterogeneous in forest structure and composition. Major forest composition 'types' include: pure lodgepole pine, lodgepole pine with aspen, and lodgepole pine with Engelmann spruce and subalpine fir. Evidence suggests that forest recovery following MPB will follow different trajectories depending on pre-MPB composition, further differentiating forest conditions. Variation among forest types' fuel complex will likely cause substantial variation in post-MPB potential fire behavior. This variation necessitates different management strategies for different forest types. In this study we compare modeled forest structure and fuel complex changes among forest types in the century following MPB. We then develop future forest management alternatives for different forest types and evaluate management effect on fuels and potential fire behavior. Forest structure and fuel complex changes are simulated from data collected from beetle-infested forests distributed throughout northwestern Colorado. From modeled future forests, we design stand-scale management prescriptions to be implemented 20 – 80 years after MPB attack. Management options include combinations of prescribed fire and mechanical treatments. We evaluate the effects of these options on fuel complex and potential fire behavior at 50th, 80th, 90th, 97th and 99th percentile weather conditions over 100 years of stand development. Our work identifies model limitations and strives to represent uncertainty inherent to forest growth and fire behavior simulations. This project will provide information to forest managers about possible future treatment options for forests of various species compositions, and about how these options will affect future forest fuel complex and potential fire behavior.

Penman, Trent

Trent Penman, Research Fellow, Centre for Environmental Risk Management of Bushfires, University of Wollongong. Trent is an bushfire risk modeller at the University of Wollongong, Australia. His work seeks to examine trade-offs in

investment in fire management in reducing risk to people and property. Previously, he has been involved in long term fire ecology research programs which have been published widely in the international literature.

Oral presentation, Thursday, 1705, B118

Integrated wildfire risk modelling

Wildfire can result in significant losses to people and property. Management agencies undertake a range of preventative (the shield) and responsive (the sword) actions to reduce this risk. Data relating to the success of individual treatments varies, with some approaches well understood and others less so. Research has rarely attempted to consider the interactive effects of treatments in order to determine optimal management strategies that reduce the risk of loss. Bayesian Networks provide a statistical framework for undertaking such an analysis. Here we apply Bayesian Networks to examine the trade-offs in investment in preventative actions (e.g., fuel treatment, community education, development controls) and suppressive actions (e.g., initial attack, landscape suppression, property protection) in the Sydney Basin, Australia. Fuel treatment within 500m of the interface has the largest effect in reducing the risk of high intensity fires reaching property. Once a fire has reached property there is a strong interactive effect of suppression and development controls. The framework presented provides a quantitative method for improving expenditure in fire management actions.

Perrakis, Daniel

Daniel Perrakis is the Fire Science Officer for the BC Wildfire Management Branch. He has held that position since 2010, and was previously a Fire Ecologist for five years with Parks Canada Agency out of Calgary Alberta. He has published on subjects including fire-bark beetle interactions (post-fire mortality of ponderosa pine), burn severity monitoring, fire history, and fuels and fire behaviour. He is is certified Fire Behaviour Specialist in BC and lives in Victoria, BC, Canada.

Oral presentation, Tuesday, 2:05 PM, B115

Observations and modeling of fire behaviour in mountain pine beetle-killed forests in British Columbia

Mountain pine beetles ('MPB') have killed tens of millions of hectares of lodgepole pine- ('Pl') dominated forests in western North America, including 20 million ha affected across British Columbia. Despite a number of recent studies discussing and modeling fire behaviour in these stands, few observed data have been presented, and the question remains: do MPB-affected stands present increased or decreased fire hazard compared with unaffected pine stands, and what is the nature of post-MPB fire behaviour changes? We used evidence from photographs, measured wildfire spread rates, and experimental burns to develop a set of Rate of Spread (ROS) data, and attempt to fit an empirical ROS model according to the conventions of the Canadian Fire Behaviour Prediction (FBP) system. Overall, the ROS in MPB-affected stands (1-8 years since attack) was on average 2.6 times faster than predicted using the C-3 model representing unaffected pine stands. The implications for fire behaviour modeling in red-attack and gray-attack stands are discussed. Further studies and monitoring of fire behaviour in MPB-affected stands are sorely needed, but the present findings offer some guidance for managers to consider to meet the ongoing needs for fireline safety and operational effectiveness.

Peterson, Birgit

Birgit Peterson is employed by ASRC Research and Technology Solutions as a contractor to the USGS as the Earth Resources Observation and Science Center in Sioux Falls, SD. She has worked for the LANDFIRE project for the past seven years and her research focus is on incorporating lidar remote sensing data into canopy structure and fuels mapping.

Oral presentation, Wednesday, 1:40 PM, B110

LANDFIRE Existing Vegetation Cover and Height: Improving the National Products

Among the myriad of LANDFIRE products available are layers representing forest canopy cover and forest canopy height. These data layers are critical for a number of applications. For LANDFIRE National 2001 forest canopy height was derived using Landsat imagery and Forest Inventory and Analysis (FIA) field plot observations as well as a suite of ancillary data layers. The LANDFIRE National 2001 forest canopy cover values were largely obtained from the National Land Cover Data forest cover product. The LANDFIRE National 2001 updating process for forest canopy height and cover relied on regression tree models with FIA plot values of forest canopy height or cover as the dependent variables, using predictor variables derived from Landsat imagery, terrain data, and a Shuttle Radar Topography Mission (SRTM) basal-area-weighted canopy height metric. The SRTM data provide a vertical structure measurement not available from Landsat imagery, and particularly valuable to the canopy height modeling process. Updating the 2001 base vegetation maps to the 2008 era relied on a set of annual disturbance layers that combined vegetation disturbance information derived from Landsat time series data

with contributed polygonal data describing management activities on federal and state lands. Once disturbed areas were delineated, the existing structure data were updated based on pre-determined vegetation transitions. In forested areas, FIA data were used to model ten years of growth for each vegetation/disturbance combination using the Forest Vegetation Simulator (FVS). The vegetation conditions predicted by FVS were used to define vegetation transitions in disturbed areas. FVS was also implemented without incorporating disturbances to determine vegetation transitions in undisturbed areas. The forest canopy height product will continue to be refined through inclusion of Geoscience Laser Altimeter System (GLAS) data. GLAS observations are correlated with canopy structure and can be used to augment plot data, especially where field data are scarce.

Peterson, David

Dave Peterson is a Research Biologist with the U.S. Forest Service Pacific Wildland Fire Sciences Lab in Seattle and Affiliate Professor at the University of Washington. He is Team Leader for the Fire and Environmental Research Applications team which conducts research on fire science, fuels, and climate change. He has conducted research on fire ecology and climate change in mountain ecosystems throughout the western United States, and has published over 200 scientific articles and three books. He is lead author for the U.S. National Climate Assessment and as contributing author for the Intergovernmental Panel on Climate Change was a co-recipient of the Nobel Peace Prize in 2007. His current research focuses on hazardous fuel treatment issues and climate change adaptation.

Oral presentation, Thursday, 11:25 AM, C121

Managing fuels in a greenhouse world: a framework for adaptation

Land management agencies in the United States are in the early stages of assessing vulnerability of natural resources to climate change and developing adaptation options. Much attention has focused on projecting how large disturbances such as wildfire will increase in a warmer climate, but proposed adaptive responses have mostly been strategic (e.g., increase resilience) and not coupled with tactical responses for on-the-ground projects and planning. We focus on "principles of a firesafe forest" to identify actions that manipulate forest structure and fuels in fire-prone forests and promote a transition to a permanently warmer climate. In dry forests of the western United States, mechanical thinning and fuel removals will generally be more effective than prescribed fire, which will face challenges from drier fuels, air quality restrictions, and wildland-urban interface proximity. Thinning to lower densities, removing more surface fuels, and shortening the treatment interval will be more effective in some cases. In pine-dominated forests of the southern United States, prescribed fire will continue to be the best fuel management technique, although applying fire more frequently in some locations may be advisable. Most fuel management practices will reduce long-term carbon storage, but can reduce large pulses of carbon emissions over time. Any modification of fuel management to address climate change will need to consider effects on resources such as wildlife habitat. In general, we anticipate that only small changes in fuel management will be necessary or advisable in the next 50 years or so. The effects of a warmer climate and elevated ambient carbon dioxide on forest dynamics, insects and disease, and fuel production are uncertainties that will need to be incorporated in fuels planning over time.

Picotte, Josh

Josh J Picotte Fire Specialist ASRC Research and Technology Solutions, Contractor to the U.S.Geological Survey (USGS) Picotte, J. J. and K. M. Robertson (2011). "Validation of remote sensing of burn severity in south-eastern US ecosystems." International Journal of Wildland Fire 20: 453-464.

Oral presentation, Wednesday, 3:25 PM, C125

Deriving regional burn severity thresholds from remotely sensed data

The Monitoring Trends in Burn Severity (MTBS) program has mapped the spatial variation of burn severity for over 14,000 large fires that burned in the United States between 1984 and 2010. For MTBS the low, moderate, and high burn severity was manually interpreted from Landsat 30m Normalized burn ratio (NBR) and differenced NBR (dNBR) satellite imagery. Subjectivity in the creation of the burn severity datasets can make comparisons between fires problematic. To address this limitation, we utilized Lutz et al. (2011) method to determine the continuous probability distribution of the burn severity for all 14,000 MTBS fires. For each fire, we randomly sampled NBR or dNBR pixels from each burn severity category (low, moderate, and high) in proportion to the area they represented within the fire perimeter. Probability distributions were fitted using sigmoid functions, and a burn severity metric was subsequently calculated for each fire by estimating the area underneath the curve. The calculation of a continuous burn severity metric for each fire allows for more robust comparisons of burn severity between fires, when compared to the previous method of characterizing fires by the number of pixels

in each burn severity category.   Lutz, J. A., C. H. Key, C. A. Kolden, J. T. Kane, and J. W. Van Wagtendonk. 2011. Fire frequency, area burned, and severity: A quantitative approach to defining a normal fire year. Fire Ecology 7:51-65.

Pierce, Andrew

Dr. Andrew D. Pierce is a post-doctoral Junior Research Faculty member in the Department of Natural Resources and Environmental Management at the University of Hawai'i, Manoa. His interests are in landscape patterns of fuels, and in investigating the interaction between fire, fuels, and the physical landscape using models. He is the first author of the recent publication in Forest Ecology and Management titled "The use of random forests for modeling and mapping canopy fuels for fire behavior analysis in Lassen Volcanic National Park".

Oral presentation, Wednesday, 4:40 PM, C120

Comparing fuel models for fire behavior prediction with observed fire behavior during a prescribed fire at Hawai'i Volcanoes National Park

Invasive grasses are a critical factor affecting fire size in dry to mesic ecosystems in Hawai'i. However, observations comparing observed fire behavior with in situ fuels measurements and fire behavior modeling are sparse. We quantified fuel loads, fuel moistures, and fire weather in a Natal red-top (Melinis repens) and molasses-grass (Melinis minutiflora) invaded coastal mixed grass and shrub system in Hawai'i Volcanoes National Park (HAVO). We developed a custom Fire Behavior Fuel Model (FBFM) and calculated flame lengths (FL) and rates of spread (ROS) using BehavePlus5® and also used several standard grass fuel models for comparison. We compared our results with fire behavior observations recorded during a prescribed fire in August 2011 using a video camera. Flame heights and angles were measured and converted to FL. ROS were measured for six intervals, and a boot-strapping algorithm was used to construct estimates of the mean, standard deviation, and 95% confidence intervals of FL and ROS. Observed wind speeds averaged 24 kmph. 1-hr, 10-hr, live woody and live herbaceous fuel moistures were 8%, 9%, 37% and 204% respectively. Average FL was 1.19 m, 90th percentile maximum FL was 3.73m, and ROS was 0.53 m/s. Compared to six standard FBFM and our custom FBFM, the custom model moderately overpredicted FL and RoS by 34% and 46% respectively. All of the standard FBFMs over-predicted ROS by an average of 315% except GS3, which was within 10%. All of the fuel models, over-predicted average FL and average maximum FL. Fuel models GR3 and GS3 predicted 90th percentile maximum FL to within 10%, but the custom model overpredicted by 34%. Our results highlight that despite limited published research on FBFM construction and validation in tropical fuels, careful choice of existing FBFMs can achieve relatively good accuracy in fire behavior prediction.

Piikkila, Erik

Erik Piikkila, Disturbance Ecologist, Cascadia Ecosystems and Disturbance Legacies Project   I have presented about Railroad Logging at four of five scientific conferences I have attended in the last three years. During this period, I have also organized, moderated and presented at three symposia/special sessions about the Biological, Landscape, and Disturbance Legacies of Railroad Logging.   I am the only ecologist that is studying Railroad Logging and Fires.

Oral presentation, Wednesday, 11:25 AM, B114

Railroad logging and historic mega fires in the Pacific Northwest 1846 - 1957: Massive multi decadal fuel buildups, post railroad logging fires, convergence (the perfect storm) of multiple mega fire conditions, disturbance legacies, and differences between public and private land

Are mega fires a new and increasing phenomena that have impacted many Western landscapes over the past 30 years, especially in the last decade? Are there any historic periods of mega fire activity that have been forgotten to time, hidden from view in 50 to 170 year old stands? Did a forgotten harvesting system called railroad logging shape mega fire activity and initiate several historic and iconic mega fires such as the Tillamook and Yacolt Burns? What were the factors and/or conditions that created mega fires? Using historical documents that span 1899 - 1961 - 2012, 65+ historic sites in the Pacific Northwest were identified with recorded railroad logging and fire histories. From similar documentation, several historic mega fires with very similar mega fire conditions as the railroad logged and burned areas, were also identified. Railroad logging initiated several of these mega fires. Twelve mega fire sites were identified. Mega fire potential peaked in the 1920's and 1930's with the height of railroad logging, the two warmest decades until the 1990's and the 2000's, and a moving 20 - 36 year window of high fire hazard for logging slash. Vast slash volumes (minimum) that ranged from 122 m3/ha - 1226 m3/ha covered an annual average of 81,000 hectares, 1.62 million hectares (1890 - 1920), and 1.2 million hectares (1920 - 1940) from harvesting in westside Washington and Oregon forests. In the 1920's, post railroad logging fires annually burned 3.9% of cutover area. In one westside region (1922 - 1927), a total of 361 fires burned 44,278 hectares. Railroad logging generated 222 fires (62% of total no. of fires) and burned 37,668 hectares (85% of total area burned). Fires ranged

in size from 46 - 326 hectares. Yearly fire area ranged from 560 - 15,909 ha. Fire ecology linkages between railroad logging and mega fires have never been made. Ten million acres of railroad logged areas in the PNW may provide a unique outdoor laboratory that can be used to understand mega fires and provide fire management solutions for the 21st Century.

Pilliod, David

DAVID S PILLIOD – Supervisory Research Ecologist, US Geological Survey, Forest and Rangeland Ecosystem Science Center, Boise, Idaho.   David first became interested in fire while working on a fire crew with the Lewis and Clark National Forest in 1994. He completed a BA in Biology from University of California Santa Cruz and a PhD in Ecology from Idaho State University. David was an Assistant Professor at California Polytechnic State University before joining the USGS Forest and Rangeland Ecosystem Science Center in 2006. David recently published an article in Forest Ecology and Management on how prescribed fires influence effectiveness at reducing wildfire severity in dry coniferous forests. David is particularly interested in natural disturbances, restoration, and adaptive management strategies that stem from applications of long-term monitoring data.

Oral presentation, Wednesday, 11:25 AM, C125

Effects of land treatments on subsequent wildfire and vegetation state transitions in the Great Basin

Thousands of hectares of federal land in the Great Basin are "treated" annually with the goal of providing forage for livestock, improving wildlife habitat, combating invasive species, reducing fuels, and stabilizing soils. We investigated whether this mosaic of land treatments influenced subsequent wildfire and vegetation state transitions using data from MTBS and LANDFIRE. Using the Land Treatment Digital Library, we found 6,800 land treatments were conducted between 1940 and 2010 covering approximately 2.75 million hectares (6.8 million acres). Preliminary results suggest over a third of all land treatments in the Great Basin have burned since being treated with many re-burning 1-2 times and some up to 14 times. Drill seeding and aerial seeding treatments, which were usually conducted to stabilize soils after wildfire, frequently re-burned within 10 years. The probability of wildfire decreased over time for most treatments. Vegetation state transitions from sagebrush shrubland to invasive grassland could be detected by LANDFIRE data. Land treatments in invasive grasslands were unlikely to transition to native shrubland, partly because of frequent wildfires.

Platt, Emily

Emily Platt Graduate Research Assistant, Oregon State University College of Forestry   Emily Platt is a Ph.D. student in the College of Forestry at Oregon State University. She received a B.A. in English Literature from Gonzaga University. Before returning to school, Emily was the executive director of the Gifford Pinchot Task Force, a non-profit group in the Northwest focused on collaboration and restoration of federal forestlands. Emily's leadership was honored with an Innovator's Award from 1000 Friends of Oregon in 2010.

Oral presentation, Wednesday, 1:15 PM, B113

Title of Presentation: Fire Management and Restoration Decision of Federal Land Managers

The structure and pattern of central Oregon forest landscapes has been significantly impacted by management and wildfire. The size of fires in central Oregon has increased dramatically in past two decades, and large, contiguous areas are now responding to recent wildfires. Fire has threatened homes and communities in the central Oregon that have developed at the edge of forestland where people have moved to enjoy the close proximity to forests.   Much of the landscape in central Oregon is dominated by federal lands, and management decisions on these lands play a major role in influencing landscape pattern and the response of forests to fire. Federal land managers are currently implementing activities aimed at creating more resilient landscapes, protecting communities in the wildland-urban interface, and supporting local mills and businesses that specialize in forest management work. Interviews with federal land managers in central Oregon revealed different approaches to management based on the conditions of the land, social influences, and administrative constraints. This research explores various approaches to management of frequent-fire forests and the implications of these approaches. Consideration is given to shifts in policy or administrative constraints that could support progress toward stated management objectives.

Porensky, Lauren

Dr. Lauren Porensky is a recent graduate of the Graduate Group in Ecology at UC Davis, and has just begun a post-doctoral associate position at the University of Nevada, Reno with Dr. Elizabeth Leger. Lauren's research interests include how

human activities and natural disturbance impact plant communities in multi-use landscapes, and before moving to the Great Basin, she has worked in rangeland systems in California and Kenya.

Oral presentation, Wednesday, 4:15 PM, B115

Selecting the best species and genotypes for restoration in challenging environments

Post-fire revegetation is a major challenge in arid and semi-arid climates. Seeds used for restoration in in these areas face many challenges to establishment, including highly variable precipitation and competition with invasive plants. The research in my lab focuses on the question, can we improve restoration in the Great Basin by using species and genotypes that are particularly well adapted to growing in disturbed and invaded environments? Using field and greenhouse studies, we have investigated the performance of early-seral species for use in cheatgrass (Bromus tectorum) invaded areas, and have used applied evolutionary methods to understand how plant genotype affect restoration. We have found evidence that some native, early-seral, annual forbs are particularly competitive with cheatgrass, and that some native perennial grasses growing in areas invaded with cheatgrass are more successful at tolerating cheatgrass competition and suppressing cheatgrass biomass than plants from nearby uninvaded areas. Additionally, we have found considerable variation for competitive ability with invaders between species, populations, and among individual plants within populations. Finally, we have identified specific traits that improve survival performance in the greenhouse and in field, including root traits, shifts towards early phenology, and decreased plant size. Our results suggest that restoration success in arid systems could be improved by selecting particularly competitive native species, populations or genotypes for use in highly disturbed systems. We recommend screening the performance of potential restoration material in wildland trials, and recommend selecting species and seed sources for restoration that can perform well in both agricultural settings and in challenging restoration sites.

Poulos, Lauren

Lauren Poulos is a graduate student in the Institute of Ecology and Evolution at the University of Oregon, and she has been the recipient of multiple scholarships [Donald E. Wimber Fund Award Recipient for 2010 - 2011; Travel, Research and Educational Experience (TREE) Grant Award Recipient for 2011] for travel and presenting research at national conferences (The 96th Annual Meeting of the Ecological Society of America, Austin, TX 2011; The 97th Annual Meeting of the Ecological Society of America, Portland, OR 2012; Interior West Fire Ecology Conference: Challenges and Opportunities in a Changing World, Snowbird Resort, UT, 2011).

Oral presentation, Tuesday, 11:25 AM, C126

Interactions between prescribed fire and the invasive grass, Brachypodium sylvaticum, in the Willamette National Forest, OR

Brachypodium sylvaticum, an aggressive invasive grass native to temperate Eurasia, is classified as a noxious weed in CA, OR and WA, and could possibly cause ecosystem collapse by altering fire regimes. To examine interactions with fire we divided two sites in the Willamette National Forest into eight units, and randomly selected half for treatment with prescribed fire. Possible outcomes: (1) Fire severity/intensity may increase in well-established areas with the accumulation of finer fuels from B. sylvaticum. (2) Conversely, because B. sylvaticum stays green late into the fire season, it could have a dampening effect and decrease fire severity and intensity. (3) Fire may facilitate the spread of B. sylvaticum by exposing the soil, increasing light levels due to a reduction in canopy and by increasing seed dispersal on crews and equipment. (4) Fire may control the invasive by killing established plants and seeds. In a complementary greenhouse study, we sampled soil cores from every plot to assess whether fire affects the seed bank of B. sylvaticum. Germination was compared between fire treatment plots and controls. The fires were set in the spring of 2011. Results We found that B. sylvaticum density decreases fire severity, $\chi 2 = 11.92, 63$ and $P = 0.0077$, with differences between the sites. The greenhouse experiment showed that an increase in severity was shown to significantly decrease B. sylvaticum seedling germination (Wilcoxon Test=13.674,46 , P=0.0084) without a significant difference between the sites, a trend also seen in the field (26.72±64.27/plot burned vs. 44.63±84.80/plot controls, P=0.0318).

Power, Mitchell

Mitchell Power holds a split position at the University of Utah with partnerships between the Natural History Museum of Utah and the Department of Geography. His interests include botany, paleoecology, biogeography, fire history, and paleoclimatology. As Curator of the Garrett Herbarium, Mitchell has been developing a digital database and pollen reference collection from the museum's 130,000 plant specimens. He is currently investigating sediment cores collected from the Uinta Mountains, eastern Great Basin and Pacific Northwest. Mitchell was the invited speaker at the 2011 International Quaternary Association session on Paleofire in Berne, Switzerland and has been a scientific steering committee member of

the Global Paleofire Working Group. His recent works explores the impact of the "Colombian Encounter," when Europeans began to settle the New World during the 15th and 16th centuries. Mitchell continues to pursue his western U.S. and international research interests including recent publications on paleofire regimes in Mediterranean ecosystems of southern Europe, and several research projects in the Neotropics, including paleoecological studies in Brazil, Bolivia and French Guiana.

Oral presentation, Tuesday, 11:00 AM, B113

Climate, people and fire during the Holocene: What geographic scale did prehistoric people influence past changes in biomass burning?

Direct evidence of the prehistoric use of fire to modify ecosystems has been observed on small islands and individual sites, but is difficult to quantify on larger, regional and continental scales despite conventional wisdom on the prehistoric use of fire. One example that has generated considerable debate is the decline in biomass burning in the Americas after 1500 AD. A synthesis of over 800 hundred charcoal records from the Americas and the rest of the globe suggest a distinct decline in fire after 1500 AD that is also coincident in time with the Little Ice Age climate cooling and the population collapse in the Americas. Comparisons with independent paleoclimatic records and population reconstructions suggest changes in climate during the Little Ice Age provide the most parsimonious explanation of changes in biomass burning. On millennial time-scales, periods of high fire activity were relatively common in the early Holocene and are consistent with regional and global climate variability. There is little evidence from the paleofire reconstructions to support the Early Anthropocene Hypothesis of human modification of the global carbon cycle. Evidence from charcoal-based reconstructions does not eliminate the potential influence of human activities on biomass burning during the Holocene, but illustrates the importance of geographic scale when considering human versus climate drivers of past fire activity.

Prato, Tony

Tony Prato is Co-Director Emeritus and researcher for the Center for Applied Research and Environmental Systems at the University of Missouri, Columbia. He is a Professor Emeritus at the College of Agriculture, Food and Natural Resources at the University of Missouri-Columbia and is an affiliate faculty member at the College of Forestry and Conservation at the University of Montana. Travis B. Paveglio is a postdoctoral researcher at the University of Montana, Missoula. He is currently working on a National Science Foundation funded project exploring current and future wildfire risk in Flathead County, MT.

Oral presentation, Wednesday, 2:30 PM, B113

Simulating the effects of land use policy scenarios on wildfire risk in Flathead County, Montana

This study used a coupled natural-human systems simulation model to evaluate how different land use policy scenarios are likely to influence wildfire risk in the wildland-urban interface (WUI) for Flathead County, Montana. The model accounts for the complex socio-ecological interactions among climate change, economic growth, land use change and policy, homeowner mitigations, and forest treatments in Flathead County's WUI over five 10-year subperiods (2010-2019, 2020-2029, 2030-2039, 2040-2049 2050-2059). Wildfire risk, defined as expected residential losses from wildfire [E(RLW)], depends on the number of residential properties on parcels, the probability that parcels burn, the probability of wildfire losses to residential structures on properties given the parcels on which those properties are located burn, the total value of residential structures, the average percentage of wildfire-related losses in aesthetic values of residential properties, the total value (structures plus land) of properties, and the climate change scenario. E(RLW) for the five subperiods was simulated for a moderate economic growth scenario, current, moderately restrictive, and highly restrictive land use policy scenarios, and the A2 greenhouse gas emissions scenario. Results show the effects of varying the land use policy scenario on the amount, type, and location of future residential development in Flathead County's WUI and subperiod values of E(RLW). Statistical tests were applied to the subperiod values of E(RLW) for the Flathead County WUI and at smaller neighborhood scales to determine whether the moderately restrictive and highly land use policy scenarios significantly lower wildfire risk compared to the current land use policy scenario. Both the approach and results of the study can help land and wildfire managers to better plan for future wildfire risk and identify residential areas having potentially high wildfire risk

Prestemon, Jeffrey

Jeffrey P. Prestemon, Research Forester/Project Leader, Southern Research Station, USDA Forest Service. Jeff, with his collaborators, with funding from the National Fire Plan, the Joint Fire Science Program, and the Department of Homeland Security, has advanced the science of spatio-temporal firesetting processes and the effectiveness of alternative interventions into them to achieve societal benefits.

Oral presentation, Thursday, 3:50 PM, B118

Humans Are Predictable—A Potential Advantage In Wildfire Forecasting

Research demonstrates that patterns of arson wildfires have predictable components at fine spatial and temporal scales that can be exploited to produce more precise forecasts than those derived from other common approaches. A large share of wildfires in the United States and elsewhere are human-caused, and these tend to be more damaging, on a per-acre basis, than 'natural' wildfires. In some parts of the United States and in southern Europe, intentionally set wildfires account for the majority of wildfires reported. Better arson forecasts, while entailing research and development costs, have three potential benefits: they (i) enhance the effectiveness of prevention efforts, including law enforcement, which is a proven way of reducing the occurrence of reported arson wildfires; (ii) improve the readiness of firefighting resources, thereby reducing fire crew response times, resulting in smaller and less damaging wildfires; and (iii) enable better placement of fuel treatments and other hazard reduction efforts, so that the wildfires that do occur are less damaging. This presentation describes arson forecasting for locations in the U.S. and Spain. Alternative statistical forecast models are compared, including those that recognize the autoregressive processes of arson wildfires and those used by crime mapping software (e.g., CompStat). Forecasts are used to simulate the effect of the forecasts on law enforcement allocation, reduced firefighting response times, and fuel treatments. Using the simulation results, we provide an example calculation of the net benefits generated from use of the best performing statistical forecast model.

Price, Owen

Owen Price, Senior Research Fellow, Centre for Environmental Risk Management of Bushfires, University of Wollongong. Owen is a landscape ecologist specialising in fire behaviour and ecology in Australian savannas and eucalypt forests. His research focuses on empirical evaluation of the effectiveness of management for mitigating the impacts of wildfires. One example is the use of historical fire mapping to quantify the effectiveness of prescribed fire at reducing subsequent wildfire area in a range of biomes around the world.

Oral presentation, Thursday, 1:40 PM, B118

Wildfire mitigation in the landscape or near the houses? An Australian perspective

The great majority of house loss in Australia occurs in the forested regions of the south-east and south-west, and under extreme weather conditions. The range of mitigation measures is broad, and research has been conducted into the effectiveness of some but not all of these. Some salient points are: • Rapid attack is effective at containing most single occurrence fires. • About 80% of fires that burn the WUI under extreme weather ignite within 2 km of homes. • Prescribed burning has a limited effect on reducing fire spread, area or severity, especially under extreme weather. • The nature of the garden, the presence of other nearby houses and the amount of forest within 1 km of houses have strong effects on the likelihood of houses burning. • Levels of community preparedness are generally low and difficult to improve. • Although campaign suppression is a major strategy, there is little evaluation of its effectiveness. • Extreme weather compromises all aspects of fire mitigation.   Taken in totality, these results suggest that there is strong benefit from making houses and gardens more resilient and from fuel treatments in the immediate vicinity of houses. Landscape treatments have less value. There are large unknowns, including evaluation of the cost/benefit equations for many of these strategies, especially for campaign suppression and community education. There is also a poor understanding of the spatial variation in house vulnerability. In this talk I will review the evidence and make comparisons where possible with southern California.

Procter, Trent

Trent Procter, Pacific Southwest Region Air Quality Program Manager, USDA Forest Service   Trent Procter has been with the Forest Service Air Quality Program for the last 23 years and has managed the Pacific Southwest Region Program since 2004. In addition to providing advice to the Regional Forester on regulatory compliance and policy, Trent is responsible for developing a program of monitoring, assessment, and research collaboration that protects values on National Forests in California that might be affected by air pollution. He is most proud of the excellent working relationships that have been established between land management and air quality regulatory agencies in recent years.

Oral presentation, Thursday, 2:30 PM, B116

Cooperative relationships for successful air shed management: lessons learned in California air sheds.

Managing smoke produced from prescribed burning is a balance between coordination with the smoke of others, meeting regulations and standards at federal, local and state levels and ensuring that "smoke events" are avoided through proper

planning and preparation. We will examine how good communication and attention to mitigating air quality impacts can help in developing a collaborative relationship with regulatory agencies in a complex regulatory environment.

Pyke, David

David A. Pyke is a Research Ecologist for the U.S. Geological Survey's Forest & Rangeland Ecosystem Science Center in Corvallis, Oregon. He conducts research on arid and semiarid ecosystems where invasive species are currently changing the fire regimes and threatening the resiliency of these ecosystems. He was the lead author of the Restoration Ecology paper title "Fire as a Restoration Tool: A Decision Framework for Predicting the Control or Enhancement of Plants Using Fire."

Oral presentation, Wednesday, 1:40 PM, B115

Role of Fire in Rangeland Restoration

Fire as a natural disturbance often triggers successional trajectories shifting dominance among species with varying tolerances to fire. Woody non-resprouting species are killed and require seeds for re-establishment, while resprouting species maintain viable roots where shoots can re-emerge and their position within the community dominance hierarchy is only minimally impacted. Rangelands typically include non-forested ecosystems. Fires may become the restorative agent that eliminates fire-sensitive trees that have spread into rangelands. The tall grass prairie and the sagebrush biomes are examples where fire controls tree boundaries. Fire may not always restore rangeland ecosystems, but it may act as a driver of ecosystem change when fire tolerant species invade ecosystems and change fire regimes in such a way that fire provides a positive feedback to maintain invasive species. Examples of these include red brome (Mojave Desert), buffelgrass (Sonoran Desert) and cheatgrass (Great Basin). Through their invasion and dominance, they are increasing the frequency of fires and through positive feedbacks increase their own dominance at the expense of native species in the ecosystem. Once these species dominate, a biological threshold has likely been crossed to an alternative stable state that will require active restoration to recover the previous structure and function of these ecosystems. When annual grasses trigger these changes, we have preliminary evidence that as distances among perennial plants increases, as can occur with inappropriate livestock grazing, then ecosystem resistance is threatened and these invasive annual grasses will likely become abundant in patches. If perennial grasses become more associated with shrubs then fire may also threaten perennial grasses thus expanding the space for annual grasses. Wildfire rehabilitation is often the only potential method for recovery in these situations, but reviews of the literature and of monitoring reports indicate success of these projects is unlikely when precipitation is low.

Pyne, Steve

Steve Pyne, professor and resident pyromantic, School of Life Sciences, Arizona State University.   Author of over 20 books, most of them concerning fire history and management, including Fire in America and Year of the Fires.

Plenary talk, Friday, 8:20 AM, Ballroom

Back to the future: analogues for the history to come

America's modern fire history now extends over a century. It has undergone two major recharterings. The first extended roughly 50 years, centered on fire's removal, and established the U.S. Forest Service as a hegemon. The second, what might be termed our great cultural revolution on fire, argued for fire's restoration, and has promoted a pluralism of practices and agencies. The first established a fire commons based on a collective purpose to suppress fire. The second strives to recreate a fire commons by expanding operations to landscape scales, creating consortia of institutions, and promoting an all-fires strategy; but it still struggles, having broken that monolith apart, to reassemble the pieces into a new working whole. It has learned that it's easier to take fire out than to put it back. Now it appears we may be poised to enter another cycle. What analogues might help understand this emerging future? The talk will explore several models drawn from contemporary experience, including Arab Spring, Prometheus Shrugged, Genesis Device, Chapter 11, Fiscal Cliff, and the Euro. It rejects the assertion that we are headed into a no-analogue future; there are always analogues. The problem is that there are too many to choose from, and we won't know which applies until the future has happened. The only prophecy that will work is one that is believed and, by acting on it, becomes self-fulfilling.

Queen, Lloyd

Lloyd Queen is a professor at the University of Montana.

Oral presentation, Thursday, 4:15 PM, C126

Preparing tomorrow's wildland fire managers

Montana is shaped by wildfire. Our forests and grasslands burn frequently, citizens are concerned about the impacts of smoke and the risks of fire to their homes, and many Montanans are involved in fire, from working on hotshot crews to working as Forest Service fire scientists. College students make up much of Montana's firefighting force. More than 50% of The University of Montana-Missoula's College of Forestry undergraduate and graduate students identified themselves as wildland firefighters in 2010. Many of those students will choose to go on to a career in fire, finding jobs at the Forest Service, the BLM, or the MT DNRC, managing fire on public lands. Those future managers are challenged to both meet academic requirements for their degrees and fulfill the qualifications necessary to advance their firefighting qualifications. This next generation of public land managers will be challenged to incorporate advanced knowledge of subjects like GIS and the ecological effects of fire with efficient on-the-ground decision making. Neither a degree nor fire qualifications alone can prepare students for these future conditions.

Quigley, Thomas

Tom Quigley is science co-lead for the Cohesive Strategy. He is Senior Science Advisor for Management and Engineering Technologies International (METI), Inc, From 2003 to 2006, he was the Station Director of the US Forest Service Pacific Northwest Research Station.

Oral presentation, Thursday, 11:00 AM, B117

An Introduction of the National Cohesive Wildland Fire Strategy

The nation's wildland fires often involve difficult choices that engage multiple jurisdictions, Federal and state agencies, landowners, and diverse stakeholders. Policies that address wildland fire issues are challenged by the complexities of ownership, climate, available resources, and the potential of devastating outcomes. The National Cohesive Wildland Fire Strategy is a multi-year collaborative effort designed to address the needs of local communities, tribes, states, federal agencies, and non-governmental groups. Developing the strategy has been a phased approach involving science, managers, policy makers, technical specialists, and a wide array of stakeholders. The process involved a structured approach that helps clarify the desired objectives, examine potential actions that might help achieve the objectives, and exploration of data and information that reflects how risks might change if actions were applied. Managers and stakeholders have prioritized three broad goals related to resilient landscapes, fire adapted communities, and response to wildfire. Specific objectives, designed to achieve the goals, have been developed. Analyses have used national datasets and specific models to create a transparent view of risk and how risk might change under various options of management and policy. Three broad regions of the country are now exploring actions that they might move forward with to address wildire risk and broadly achieve their goals. The presentation will provide an update as to the current status of the Cohesive Strategy.

Quinn-Davidson, Lenya

Lenya Quinn-Davidson is a Staff Research Associate with University of California Cooperative Extension in Humboldt County, California. She has been the Coordinator of the Northern California Prescribed Fire Council since its inception in 2009, and she also serves as the Administrative Coordinator of the Washington Prescribed Fire Council and the northern California region of the California Fire Science Consortium. Lenya was raised in rural northern California, received a bachelor's degree from UC Berkeley in 2004, and completed her master's in 2009 at Humboldt State University, where she did research on impediments to prescribed fire in northern California.

Oral presentation, Thursday, 2:05 PM, B116

Communities of practice, communities of place: Growing prescribed fire councils in the Pacific West

It all started in Florida. In the late 1990s, a series of events led to the revision of the Florida Prescribed Burning Act, the development of novel gross negligence legal protections for prescribed fire users, and the creation of prescribed fire councils: collaborative groups of burners, regulators, and academics interested in furthering the art and science of prescribed fire and protecting the right to burn. The energy and success of the Florida prescribed fire community inspired nearby states, and similar efforts quickly developed throughout the southeast. Since then, the council movement has swept across North America, and new councils have popped up in more than 26 states and regions. The Pacific West is one of the last frontiers of this movement; the development of prescribed fire councils is a relatively new phenomenon in the region—one inspired by the pioneering efforts in the southeast and spurred by the 2009 formation of the Northern California Prescribed Fire Council. Since that time, councils have formed in Washington and in California's southern Sierra Nevada region, and many anticipate the development of other nearby councils in the coming years. Just as councils in the southeast provided the

framework for the Northern California council, existing councils in the Pacific West have now set the stage for the development of new councils. Councils are communities of practice, and the shared interests and experiences of participants—no matter where they are—provide a strong framework for budding efforts elsewhere. However, councils are also communities of place, and their structure, participation, and objectives are all strongly tied to their social, political, and physical landscapes. This presentation will discuss the formation of councils in the Pacific West, describing their connections to eachother and to councils in other regions, and highlighting the social and geographic factors that make them unique.

Reilly, Matthew

Matthew Reilly is a Phd student in the Forest Ecosystems and Society Department at Oregon State University studying regional forest dynamics.

Oral presentation, Wednesday, 11:25 AM, B118

A Conceptual Model for Assessing the Ecological Effects of Contemporary Wildfires at Regional Scales

Wildfires have increased in frequency and area burned across much of the world in recent decades. Despite a corresponding increase in contemporary wildfire studies, few if any studies have tackled the issue of assessing the ecological effects of wildfires at regional scales. Most contemporary wildfire studies have focused on ecological patterns and processes occurring at small scales (e.g. regeneration, community/structural change) in a single or a few, generally large, wildfires. Although recent advances in remote sensing have enabled an increasing number of studies to focus on larger landscape level effects of wildfires, most of these studies have generally been limited to quantifying and assessing drivers of spatial patterns of fire severity as opposed to focusing on actual ecological effects (e.g. changes in landscape composition/structure and corresponding losses and gains habitat types). This is likely due, at least in part, to the absence of a conceptual framework for assessing the ecological effects of wildfire effects at regional scales. Development of a conceptual framework for regional scale assessment is challenging for several reasons including diversity of vegetation, complexity of environmental and climatic gradients, and variation in the effects of wildfires. We first propose a conceptual model based on quantifying rates of change for major ecological processes at various levels of the ecological hierarchy spanning from population to landscape and regional scales. We then discuss methods for integrating regional forest inventory data with remote sensing in order to apply the model in forested portions of the Pacific Northwest across over the last three decades. Ultimately, the development of a conceptual model should provide a framework to inform conservation and resource planning and provide context in which to interpret both positive and negative ecological effects of wildfires.

Rhoades, Chuck

Chuck Rhoades is a US Forest Service researcher with the Rocky Mountain Research Station. He studies biogeochemical responses to fuel reduction treatments, post-fire rehabilitation activities, and wild and prescribed fires. His current research address the influence of the mountain pine beetle and associated management activities on forests, fuels and potential fire behavior in Colorado lodgepole pine forests.

Oral presentation, Tuesday, 2:05 PM, C120

A Fifty Year Legacy of Pile Burning – Is there Recovery without Rehabilitation?

Pile burning is a common means of reducing the fuels created by logging and post-harvest site preparation activities, in spite of the practice's negative ecological effects. The extreme temperatures and sustained soil heating that occur during the burning of piled fuels are widely acknowledged to limit forest recovery, to promote exotic species invasion and to alter the physical, chemical and biologic properties that regulate soil productivity. Simple treatments can reverse the effects of pile burning yet most burn scars are not rehabilitated. To examine the legacy of pile burning in the absence of rehabilitation we reviewed activity records and aerial photographs from the Medicine Bow-Routt National Forest dating back to the 1960s to establish a 50 year sequence of recovering clearcut units where logging residue was piled and burned for post-harvest site preparation. We sampled soil properties and tree, shrub and herbaceous plant abundance within areas created by pile burning and the surrounding regenerating lodgepole pine forests at harvest units spanning the chronosequence. The effects of high severity burning, including continuous layers of soil charcoal, burned stumps and red and hardened soil were evident across the 50-year time series. Bare soil cover remained higher in burn scars compared to the surrounding forest across the time series, and the cover and depth of the organic soil horizons was consistently lower. In contrast to the dramatically reduced tree and shrub cover within the scars, both forb and graminoid species were more abundant than in surrounding regenerating forests. In recent years, salvage harvesting and hazard tree removal associated with mountain pine beetle outbreaks have resulted in more than 100,000 piles that await burning in northern Colorado. This survey sug-

gests that without rehabilitation most of these pile burn scars will remain grass- and forb-dominated openings for at least 50 years.

Riegel, Gregg

Gregg Riegel is the Area Ecologist for the Deschutes, Ochoco, and Fremont-Winema National Forests in Oregon.

Oral presentation, Wednesday, 4:15 PM, B112

Applying current research to forest management in Central Oregon

This special session has reported on a series of inter-related studies conducted in Central Oregon joining empirical, modeling, and remote sensing approaches to understand fire regimes and forest dynamics. Our presentation concludes the session with a perspective linking science and management, including implications of our major findings for current and future land management practices. The what, how, when and where the information is applicable will vary depending on the degree of departure from our current understanding of how these ecosystems work and respond to management. In ponderosa pine systems this new information will allow refinement of our current understanding of the role of fire, while the results for mixed conifer forests are significant because this system has been the least studied locally, yet has had the majority of our recent wildfires. For the first time the Ochoco NF within the southern Blue Mountains will have a rigorous cross dated tree-ring and multi-scale dendrochronological study and fire occurrence to characterize spatial and temporal variation in historical fire regimes These results indicate a strong predictive relationship of seasonal climate conditions to the spatial extent of regional fire years and their frequency of occurrence, and suggest that climate changes may potentiate shifts in wildfire regimes and vegetation outside of the historical range and variability for the study area. We will discuss a framework of how we will begin to integrate this new information into our management practices.

Riggs, Robert

Presenter Name: Bob Riggs Presenter Title: Independent Research Ecologist Affiliation: In cooperation with USDA Forest Service, Pacific NW and Rocky Mountain Research Stations Education and Work History: With degrees in Wildlife Science (U. Idaho), and Range Science (Utah State U.), and over 20 years of experience in forest industry, Bob has focused most of his research on inter-disciplinary problem solving. Notable Achievement: Co-author of several works concerned with animal-plant interactions in disturbance-adapted ecosystems affected by fire, silviculture, and/or grazing/browsing by large ungulates.

Oral presentation, Tuesday, 4:15 PM, B110

An exploration of multi-species grazing with FireBGCv2: Can spatial herbivory concepts enlighten Landscape Fire Succession Models?

Selective grazing by large herbivores modifies biomass accumulation and structure, thereby influencing fuel loads and plant succession over time. The GrazeBGC utility is a user-optional series of integral, herbivore functional routines that have been designed to sensitize the FireBGCv2 platform to herbivory processes. The utility's routines enable the platform to initialize biomass demands for multiple herbivore populations; spatially partition each population's demands among stands and among multiple plant guilds within each stand, and then to dynamically modify guild biomass accruals and succession across the landscape. Fire behavior is then modified by herbivory to the extent that herbivory processes have influenced fuel loads and distributions. The platform's ability to capture herbivory effects was evaluated in a 400-year simulation experiment, in which 5 herbivory regimes were crossed with 3 climate and 2 fire-suppression regimes, in a 9,000-ha watershed unit comprised of 5 bio-physical sites. Stand biomass and fuel loads (Type I responses) were highly sensitive to herbivory regimes, but with significant effects contingent on the specific climate, fire-suppression strategy, and bio-physical site. Those effects and their contingencies were reflected in stand-level fire behavior (Type II responses) as well. Landscape-level productivity and fire-regime metrics (Type III responses), however, were less sensitive. The landscape's fire-return interval was most sensitive to herbivory, but landscape carbon, primary production, and ecosystem exchange metrics were comparatively insensitive. Wildlife-only and livestock-only grazing outcomes were similar to those in which no herbivory was imposed, but outcomes from multi-species grazing strategies (wildlife and livestock) diverged from those of the other (simpler) strategies over time. Herbivory effects were most pronounced under severe climate warming (Hadley A2) and least-so under the static historical climate regime. Given appropriate parameterization, the utility's enhancements can provide useful sensitivity and insight to future system dynamics where either multi-species herbivory regimes and/or climate warming are anticipated.

Riley, Karin

Karin L. Riley plans to complete her PhD in Geosciences at the University of Montana this fall. She also works for Systems for Environmental Management LLC and is stationed at the Forest Service's Missoula Fire Lab. Karin serves on AFE's Board of Directors.

Oral presentation, Wednesday, 11:25 AM, C126

Frequency-magnitude distribution of debris flow events compiled from global data, and comparison with post-fire debris flows in the U.S. West

The episodic occurrence of debris flow events in response to stochastic precipitation and wildfire events makes hazard prediction challenging. Previous work has shown that frequency-magnitude distributions of non-fire-related debris flows follow a power law, but less is known about the distribution of post-fire debris flows. As a first step in parameterizing hazard models, we use frequency-magnitude distributions and cumulative distribution functions to compare volumes of post-fire debris flows to non-fire-related debris flows. Due to the large number of events required to parameterize frequency-magnitude distributions, and the relatively small number of post-fire event magnitudes recorded in the literature, we collected data on 73 recent post-fire events in the field. The resulting catalog of 988 debris flow events is presented as an appendix to this article. We found that the empirical cumulative distribution function of post-fire debris flow volumes is composed of smaller events than that of non-fire-related debris flows. In addition, the slope of the frequency-magnitude distribution of post-fire debris flows is steeper than that of non-fire-related debris flows, evidence that differences in the post-fire environment tend to produce a higher proportion of small events. We propose two possible explanations: 1) post-fire events occur on shorter return intervals than debris flows in similar basins that do not experience fire, causing their distribution to shift toward smaller events due to limitations in sediment supply, or 2) fire causes changes in resisting and driving forces on a package of sediment, such that a smaller perturbation of the system is required in order for a debris flow to occur, resulting in smaller event volumes.

Riley, Karin

(See biographical information, above.)

Oral presentation, Tuesday, 1:15 PM, C121

Random Forests imputation of forest plot data for landscape-level wildfire analyses

Mapping the number, size, and species of trees in forests across the United States is necessary for landscape fire and forest simulations that use the Forest Vegetation Simulator (FVS). FVS is widely used at the stand level for simulating fire effects on tree mortality, carbon, and biomass, but uses at the landscape level are limited by availability of forest inventory data for large contiguous areas. Detailed mapping of trees for large areas is not possible with current technologies, but statistical methods for matching forest plot data with biophysical characteristics of the landscape offers a practical means to populate landscapes with a limited set of forest plot inventory data. We used Landfire vegetation and biophysical predictors in the Random Forests method of yalmpute in R to impute Forest Inventory Analysis (FIA) plot data with the best match, according to a "forest" of decision trees, to each pixel of gridded landscape data. Landfire data was used in this project because is publicly available, offers seamless coverage of variables needed for fire models, and is consistent with other datasets, including burn probabilities and flame length probabilities generated for the continental US by Fire Program Analysis (FPA). We used the imputed inventory data to generate a map of forest cover and height, and examine correlations with Landfire data. The results showed good correspondence between the two data sets, and the new imputed grid of inventory data can now be used for landscape simulation studies to analyze a wide range of landscape fuel management problems.

Robichaud, Peter

Peter Robichaud, Research Engineer, Rocky Mountain Research Station. Dr. Robichaud has been studying and modeling soil erosion as affected by wildfires, prescribed fires, and timber harvesting for over 20 years. His field research includes plot-scale infiltration, interrill and rill erodibility studies, small-catchment paired watershed studies and large-scale remote sensing projects. He is an international leader in postfire hydrology effects and monitoring techniques. He leads various research teams including the team that developed the popular web-based probabilistic Erosion Risk Management Tool (ERMiT) for postfire assessments. Recently he has been investigating the effects of postfire salvage logging on hilllslope erosion, and the use of remote sensing imagery for postfire burn severity classification, water repellent soil identification and erosion control treatment effectiveness.

Oral presentation, Tuesday, 2:30 PM, C120

After the Smokes Clears: Postfire Assessment Tools and Rehabilitation Treatments

The effects of climate change have increased the number, size, severity, and cost of wildfires. Given the increasing numbers of people living in wildland areas, the risk to public safety, homes, roads, infrastructure, water quality, and valued natural resources from fire and secondary fire effects has also increased. Major advancements in our knowledge of postfire assessments, risk analysis and rehabilitation treatment effectiveness have improved our ability to understand the consequences and outcomes that occur in the postfire environment. To make the best use of limited postfire rehabilitation resources, an assessment of fire effects on soils, in conjunction with local climate and watershed characteristics, is needed to identify those burned areas that are most prone to increased flooding and erosion. In addition, justification for installing post-fire hillslope and road treatments has shifted from "erosion reduction" to "protection of public safety and valued resources from probable damage or loss." This shift in post-fire management priorities has been supported by new tools and methods that incorporate new knowledge of fire effects, flood and erosion prediction, and the calculation of risk, risk reduction, resource valuation in treatment selection and treatment effectiveness. These new tools include a field guide for determining soil burn severity, a protocol for determining soil water repellency using a mini-disk infiltrometer, adaptations of predictive soil erosion models for burned forest and rangeland environments, syntheses of treatment effectiveness, and new approaches to resource valuation. These new tools are designed for and tested by post-fire assessment teams to ensure that they are usable within the time constraints of post-fire assessment, appropriately scaled, accessible, and formatted for ease of use in decision-making and assessment reports.

Rollins, Matthew

Matt Rollins is the wildland fire science coordinator for the USGS, located in Reston, VA. Prior to that he led the wildland fire science team at the USGS Earth Resources Observation and Science Center in Sioux Falls SD. Prior to that he worked for 9 years as a research ecologist at the U.S. Forest Service Missoula Fire Sciences Laboratory in Missoula, MT. His research emphases have included 1) evaluating changes in 20th century wildland fire and landscape patterns under different wildland fire management strategies; 2) integrating biophysical gradient modeling with ecosystem simulation and remote sensing for national level vegetation and wildland fuel mapping applications; and 3) integration of national level wildland fuel and fire regime data into wildland fire management decision support applications and policy. He earned a B.S. in Wildlife Biology in 1993 and an M.S. in Forestry in 1995 from the University of Montana in Missoula, Montana. His Ph.D. was awarded by The University of Arizona in 2000, where he worked at the Laboratory of Tree-Ring Research.

Oral presentation, Wednesday, 11:00 AM, B110

An Overview of Past, Current, and Future LANDFIRE Data Products and Methods

Since it's inception in 2003, the LANDFIRE project has employed a wide range of nationally consistent methods in order to produce a large suite of vegetation and fuel and fire regime products for the fire management community. These products have also been found to be useful for many other applications. Over this time, a number of versions of the data products have been produced and distributed in order to implement improvements to the original products and well as account for agents of landscape change that have occurred since the "base" circa 2001 dataset. This presentation will provide an overview of the evolution of the project in terms of data products and their applications. It will also illustrate the "data flow" process and methods used to produce the currently available versions of the data products as well future versions.

Rollins, Matthew

(See biographical information, above.)

Plenary talk, Friday, 8:45 AM, Ballroom

The influence of frequent previous fire occurrence on large fire management

Over millennia wildland fires have created a shifting mosaic of patterns across the landscapes of the United States. From a functional standpoint, fires interacted with the evolutionary ecology of vegetation, topography, geomorphology, other disturbances, land-use, local weather, and regional climate to define the demography of vegetation and ecosystems that we see today. Fires change the structural and compositional characteristics of vegetation, changing the fuelbed that is available for future fires. This process is illustrated in montane and subalpine forests of the Northern Rocky Mountains where the size, behavior, and extent of current fires are regulated by fuelbed patterns created by past fires. This self-regulatory process is a foundation of the 'Prescribed Natural Fire', wildland fire use, and adaptive management strategies implemented by fire

management organizations over the last several decades.   Fire history data show us that the landscape patterns created by wildland fires have changed dramatically over the last several decades. The conventional wisdom is that this is due to changing climate, changing land-use patterns, and the exclusion of wildland fire from ecosystems where it previously played an important part in the evolutionary environment for landscapes. Because fire is such a critical ecosystem process of many healthy landscapes, it is a natural tool for Fire Managers to maintain in their toolbox for affecting this dynamic Natural Hazard. This talk will examine recent science showing the effects of past fires interacting with the effects of current fires, and will draw heavily on examples from the 2012 Fire Season.

Roundy, Bruce

Bruce A. Roundy is a professor of rangeland ecology in the Department of Plant and Widlife Sciences at Brigham Young University. He specializes plant responses to management practices and rangeland restoration.

Oral presentation, Thursday, 1:15 PM, B112

Effects of fuel control treatments on vegetation responses across a pinyon-juniper tree invasion gradient

Fire or mechanical fuel-control treatments are implemented to reduce woody fuel loads and catastrophic fire. To determine effects of these treatments across a tree invasion gradient, we measured vegetation cover before and 2-3 years after treatment implementation. Measurements were taken on 15 subplots per treatment at 11 western juniper, single-leaf pinyon-Utah juniper, and Utah juniper-two-needle pinyon locations across the Great Basin. We used either initial tree dominance index (TDI-tree cover/tree + shrub + tall grass cover) or initial tree cover (TC) before treatment as covariates to determine tree invasion ranges over which treatments affected life form classes. Mechanical treatments of cutting or shredding trees maintained shrub cover compared to prescribed fire at TDI's of 0-0.8 and TC of < 50%. Above those TDI's or TC ranges, too little shrub cover remained to make a difference in mechanical and burn treatments. Burning increased perennial herbaceous cover by 3 years after treatment at TDI's ≥ 0.6 and TC's of 30-55%.   Cutting or shredding increased total perennial herbaceous cover both 2 and 3 years after treatment at TDI's ≥ 0.4 and TC's of 20- 70%. Mechanical treatments have the advantage over prescribed fire in that they not only maintain shrub cover but also increase perennial herbaceous cover more quickly after treatment and earlier in tree invasion than prescribed fire. Their disadvantage is that cutting leaves substantial 100 and 1000 hour fuels and shredding leaves 1 and 10 hours woody fuels after treatment.

Ryan, Kevin

Oral presentation, Thursday, 11:00 AM, B110

Session Goals Looking Back for a Clear View of the Future: 199 to 2012

Need Abstract and Biography

Safford, Hugh

Hugh D. Safford, Regional Ecologist, USDA Forest Service Pacific Southwest Region. Safford is the senior vegetation ecologist for the Forest Service's Pacific Southwest Region (California, Hawaii, Pacific Islands), and holds a research faculty position with the Department of Environmental Science and Policy, University of California-Davis. Safford manages a staff of ecologists that provide expertise in vegetation and fire ecology, inventory, and monitoring to land management on the 18 National Forests in California. Safford is the Sierra Nevada section leader for the California Fire Science Delivery Consortium.

Oral presentation, Wednesday, 2:05 PM, C121

Patterns in fire return interval departure (FRID) on federal forestlands in California, USA

In California, USA, fire regimes and related ecosystem processes have been altered by land use practices associated with Euroamerican settlement, and climate warming is exacerbating the magnitude and effects of these changes. Due to changing environmental baselines, restoration of narrowly-defined historical conditions may no longer be an ideal long-term management goal, but comparisons between historical and current fire regimes can assist managers in prioritizing areas for ecological restoration and other management actions. Fire return interval departure (FRID) analysis quantifies the difference between current and presettlement fire return intervals, allowing managers to target areas at high risk of type conversion and threshold-type responses due to altered fire regimes and interactions with other factors. We assessed FRID variability along geographic, climatic, and vegetation gradients in California on lands managed by the USDA Forest Service

and three forest-dominated National Parks. Much of northwestern California (NW) and the Sierra Nevada (SN) has missed multiple fire cycles due to fire suppression, while southern California (SC) is characterized by large areas burning at higher frequencies than under presettlement conditions. FRID was unimodally related to elevation in all three regions. FRID showed little relationship to precipitation in NW or SN, but decreased with precipitation in SC. FRID trends with temperature were unimodal, reaching a maximum at about the elevation of the mean freezing line in winter storms. Low and middle elevation vegetation types supported the greatest departures from presettlement fire frequencies, with oak woodlands, yellow pine and mixed conifer forests missing the most fire cycles, and coastal fir, coastal sage scrub and chaparral tending to experience shorter fire return intervals than under presettlement conditions. Our results help refine our understanding of departures from presettlement fire regimes across California, and provide a spatial basis for resource management and planning focused on ecological restoration and adaptation to climate change in a fire-prone region.

Safford, Hugh

(See biographical information, above.)

Oral presentation, Thursday, 11:25 AM, B118

Sword and shield strategies in frequent-fire conifer forests of California

In coniferous forests of the western United States that evolved with frequent fire, perhaps the principal land management conundrum is how to balance the growing risk of wildfire to human lives and property with the growing ecological need for wildfire to restore species, patterns, and processes negatively affected by a century of fire exclusion. Many frequent-fire coniferous forest (FFCF) types in California and the rest of the western US have missed 5-10 cycles of fire over the last 100 years, leading to a more homogenous, fuel-rich and species-poor environment dominated by fire intolerant trees. Under warming climates, increasing forest fuels, and rising human ignitions, it is proving more and more difficult to shield human lives and assets in such forests from damage by fire. Unlike in most California shrubland types, fuel treatment in FFCF types is relatively easy to align with ecological restoration goals. Fuels have increased in most FFCF landscapes due to fire suppression and other land management activities, and fuel reduction efforts thus reduce fire risk as well as departure from reference conditions. Reducing fuel density is also thought to increase the probable sustainability of FFCFs under most future climate and fire projections. Both "sword" and "shield" strategies have a place in the management of FFCF landscapes. I assess the effectiveness of shield strategies in reducing fire risk in and around the wildland-urban interface (WUI) in FFCF landscapes in California. I also review sword-type strategies, where fuel reduction has been carried out or proposed for the broader landscape, and discuss under what conditions such strategies may effectively reduce fire risk to both humans and ecosystem properties.

Salwasser, Hal

Hal Salwasser, Professor of Forest Ecosystems and Society, Oregon State University. 2011-present Consulting Director, High Lonesome Institute, DeBeque, CO. 2000-2012, Dean, College of Forestry, OSU. 1979-2000,US Forest Service: Regional and National Wildlife Ecologist; Regional Forester, Northern Rockies; Research Station Director, California. Inaugural Boone and Crockett Professor of Wildlife Conservation at The University of Montana, 1992-1995.   PhD Wildland Resource Science, University of California, emphasis wildlife and rangeland ecology. Author /co-author more than 80 professional papers and book chapters. President The Wildlife Society, 1993-94; Fellow Society of American Foresters and The Wildlife Society.   Interests: origins and transformations of world religions and conservation; sharing parenting a 9-year old daughter with wife Janine.

Plenary talk, Thursday, 8:20 AM, Ballroom

Where are We Going and Will We Like it When We Get There?

We can stand in 2013 and do a fairly good job of predicting 2013, not perfect but pretty good. From 2014 and beyond the error bars on any predictions get wider and wider. But some things we can assume will shape our future. There will be a lot more people, perhaps 9-10 billion globally and 500 million nationally by 2050. They will all want to live higher on the food chain. As national affluence increases in developing countries, people will demand cleaner air and water. People in developed countries will likely not allow relaxation in environmental protections. A large proporation of populations will live in towns and cities. Urbanites are likely to be less tolerant of wildland fire, especially as it encroches on dispersed residences. But the magnitude of such fire may be much higher than even now as climate change and inabiltity to reduce fuels sufficient to change fire behavior in many temperate parts of the globe.These likelihoods set the context for the great challenge and create opportunity for creativity. The challenge includes being hemmed in by environmental laws that constrain action

to address problems, e.g., CWA, CAA and ESA. Congress is unlikely to act to amend them to account for new science and better understanding of ecosystem dynamics. So, what will it take to change the paths we are currently on if we decide we do not like where we are headed?

Scheller, Robert

Robert M. Scheller Assistant Professor Portland State University   Dr. Scheller is a lead scientist and developer of the LANDIS-II forest model.   He is an active member of ESA and US-IALE and is the Vice Chair of the Board for the Gifford Pinchot Task Force. His interests are in forest landscape change, particularly the effects of climate change, wildfires, harvesting and insect disturbances. The consequences of landscape change include altered carbon dynamics, changes in biodiversity, loss of economic and recreational opportunities, and loss of resilience.

Oral presentation, Wednesday, 1:15 PM, B114

Long-term effects of fuel treatments and wildfire on forest carbon in a changing climate

Climate change effects on wildfire activity are dependent on fire weather, ignitions, and forest conditions at the time of fire. Removing surface and ladder fuels through forest thinning and controlled burning practices may reduce the chance of canopy fire spread if wildfires intersect with these treated areas. When considering forest carbon (C), there may be trade-offs with C removal (fuel treatments) and long-term C gain (reduced fire emissions) over time. The extent and time-frame of these potential trade-offs are relatively unknown within most forested systems, especially in regards to climate change. We used a landscape model (LANDIS-II) to simulate the multifaceted effects of climate change on forest C and succession dynamics, as well as wildfire feedbacks within the forests of the Lake Tahoe Basin (LTB), CA, NV. In the model, climate directly influences seasonal fire weather conditions; altering fuel moisture content, ignition potential, fuel availability, and fire season length, all influencing fire spread and intensity. Fuel treatments were implemented in the model, representing hand and mechanical thinning approaches currently applied on the landscape at a 15 and 30 year rotation period. Our results suggest that the LTB forests will continue to sequester C, regardless of changes in climate, mainly due to the landscape legacy effect from extensive logging of the late 19th century. Despite this, simulated wildfire activity increased because of longer fire seasons, lower fine fuel moisture content, and increased fire ignitions. Continuous fuel treatments were more effective under climate change as the intersection of fuel treatments and wildfires increased. Attaining a net carbon gain from applying fuel treatments was achieved earlier under climate change than under contemporary climate. Furthermore, strategic placement and effectiveness of fuel treatments were critical factors for reducing fire spread and intensity over time; the amount of area treated was less important.

Schultz, Cheryl

Cheryl Schultz is an Associate Professor of Conservation Biology at Washington State University Vancouver. She has been working with Fender's blue butterfly and conservation of Willamette Valley's native prairies for almost twenty years. Schultz's research focuses on questions broadly related to the population viability of endangered butterflies, including dispersal behavior and population dynamics in a changing landscape. In addition, she focuses on links between basic ecology and applied management to shed light on how to implement management tools such as habitat restoration, grass-specific herbicides, and fire. A current research focus is a collaborative project supported by SERDP (Strategic Environmental Research and Development Program) to use endangered butterflies as a model system for managing source-sink dynamics on Department of Defense Lands.

Oral presentation, Thursday, 1:15 PM, B115

Effects of fire on behavior and demography of an endangered Oregon butterfly

Fender's blue (Plebejus icarioides fenderi) is an endangered butterfly found in Oregon's Willamette Valley. Its prairie habitat has been largely lost to development, agriculture and invasive species, with remaining prairie fragments threatened by succession in the absence of historic fire. Prescribed burning is a tool used to slow the encroachment of woody plants including poison oak (Toxicodendron diversilobum), Himalayan blackberry (Rubus armeniacus), and Scotch broom (Cytisus scoparius) and to stimulate growth of the butterfly's larval hostplants, Kinkaid's lupine Lupinus oreganus and spur lupine Lupinus laxiflorus. Managers and landowners are keenly interested in the potential use of fire to manage Fender's blue habitat. In Spring 2011 and 2012, we measured the effects of fire on Fender's blue behavior by observing female butterflies in unburned vegetation and in areas that were burned the previous fall. We quantified the time butterflies spent foraging, ovipositing and flying in burned and unburned vegetation. We also recorded flight behavior (step lengths and variation in turning angles) to assess the rate of movement through burned and unburned habitat. We found that female Fender's blue

butterflies spend a larger proportion of their active time flying in unburned habitat while they spend a larger proportion of their time ovipositing in burned habitat. Further, butterflies laid 30 % more eggs in burned habitat. Analysis of flight data indicate that butterflies take shorter flight steps and stop more frequently in burned habitat. These behavioral observations suggest that behavioral responses moderate demographic effects of fire on population dynamics. While fire kills over-wintering larvae in the year of burning, active selection of higher-quality habitat in burned areas will allow populations to recover from short-term negative effects of burning.

Scofield, Anna

Anna Scofield Master's Candidate University of Wyoming   Vanvig Fellow 2012

Oral presentation, Wednesday, 1:40 PM, C126

Determining the relationship between residential development and wildfire suppression expenditures in the Rocky Mountain Region

The costs of wildland fire suppression have been rising for the past twenty years. The cause is attributable to multiple factors, and one hypothesis is that development in the wildland urban interface (WUI) significantly increases costs. Government reports indicate the link between rising suppression costs and WUI development, but there is little empirical evidence.   Rising suppression costs stress federal agency budgets and can lead to reallocation of money from other management activities. Federal fire policy mandates cost containment strategies, but those strategies have proved ineffective in the WUI. Federal agencies bear the brunt of wildland fire suppression costs with little or no ability to share costs with local governments. A "jurisdictional externality," exists in that federal agencies are charged with protecting homes from wildland fires, while local governments decide where development can occur.   This research analyzes fire suppression expenditures from 2002-2011 in Colorado, Montana, and Wyoming using an econometric model. The model incorporates spatially explicit census data, fire perimeter Geographic Information System (GIS) data, and the Federal Register definition of WUI. It contributes to the body of literature of fire suppression expenditures and fiscal impact analysis.

Scott, Joe

Joe is a Fire Modeling Specialist with Pyrologix. His recent work explores the use of Monte Carlo wildfire simulation modeling to assess wildfire hazard and risk, and to support fuel management planning.

Oral presentation, Thursday, 1:40 PM, B111

Does one percent of the land area account for ninety-nine percent of the wildfire threat?

In a landmark paper, Strauss and others (1989) described the outsized contribution of a small number of large fires to total area burned. This presentation explores whether a similarly unequal distribution of wildfire threat occurs across a landscape. The likelihood and intensity of future wildfires was assessed, using the FSim fire occurrence, growth and suppression simulation system, on a 363,678-ha study area located on the Lewis and Clark National Forest, Montana. The location, susceptibility to wildfire, and relative importance of a variety of highly valued resources and assets (HVRAs) was identified for the same study area. This wildfire hazard and vulnerability information was combined used to calculate wildfire threat—the expected value of loss to these HVRAs, weighted by relative importance. In this presentation we illustrate the relative contribution of hazard and vulnerability to ultimate wildfire threat, and demonstrate that, indeed, the overwhelming majority of weighted wildfire threat occurs in a relatively small fraction of the landscape. This finding suggests that wildfire threat mitigation activities (fuel treatments) could perhaps be focused on this small fraction of the landscape rather than across the whole landscape with the hope of affecting the few most-threatened areas.

Seibert, David

David is a graduate student in cultural and ecological anthropology at the University of Arizona in Tucson. He has worked in hydrology, botany, landscape design, and ecological restoration on Native American reservations and in Mexico, Japan, and along the U.S.-Mexico border. He lives and works in southern Arizona as the ecological restoration project director for Borderlands Habitat Restoration Initiative, and for Borderlands Restoration, L3C. Current work includes multi-partner agreements and planning for regionally scaled restoration work, across jurisdictional boundaries and in response to social and ecological damage unique to the borderlands region.

Oral presentation, Wednesday, 11:25 AM, C122

Emerging Techniques for Pre- and Post-Fire Restoration with Landscape-Scale Social and Ecological Effects in the US-Mexico Borderlands

A unique set of variables poses unique fire management challenges in the southwestern U.S. borderlands today, where creative responses are required to reach multiple objectives. Some responses are in place and many are adaptively under development, such as recent emphases on BAER treatment monitoring and a long-term monitoring plan. However, long-standing concerns about treatment costs and effectiveness persist. The Borderlands Habitat Restoration Initiative (BHRI) represents a creative, place-based response to pre- and post-fire scientific management. BHRI brings a unique suite of monitored restoration techniques to bear simultaneously on hydrology, targeted vegetation that reduces erosion and supports pollinators and food chains lost in fire, and community history and recruitment into the efforts. The platform for work is BHRI's partner, Borderlands Restoration L3C, a legal designation that combines advantages of profit and non-profit entities, extending restoration into economics in novel ways through the required pursuit of a "socially beneficial purpose." The application of natural and social science techniques enables the effort to be geared to unique assemblages, such as the US-Mexico borderlands, for both pre- and post-fire work. Today it is being tested by BHRI in southern Arizona through a flexible combination of grants, investor funds, riparian restoration projects, and early stages of cross-border plant and ecological services outreach and sales. The locally driven combination will support sustainable local and landscape-scale job creation, community development, and international ecological restoration in challenging socio-ecological environments.

Seijo, Francisco

Dr. Seijo teaches political science for various North American university programs in Spain including Middlebury College, New York University, University of Southern California and Stanford University since the year 2000. Previous experience includes work as an external consultant for the Spanish Ministry of Labor's Economic and Social Council (CES), the independent development consulting firm Development Strategies and the European Commission. His research interests are mainly in the field of environmental politics specifically all those things related to the politics of landscape fires. Dr. Seijo's work on anthropogenic landscape fires has appeared in Environmental Politics, Eos-AGU, the Journal of Environmental Policy and Planning, the Revista de Ecologia Politica, the Cuadernos de la Sociedad Española de Ciencias Forestales, Fire Ecology, Ecologie et Politique and Human Ecology Review as well as other non-peer reviewed periodicals.

Oral presentation, Wednesday, 1:40 PM, C122

Pre-Industrial Anthropogenic Fire Regimes in Transition: The Case of Spain and its Implications for future fire governance in Mediterranean type biomes

Landscape fire regimes in the Earth system are believed to be changing rapidly. These changes will have significant environmental consequences since fires are a key ecological process in many ecosystems with feedbacks on carbon cycling, soil fertility, biodiversity and regional climate patterns. Using Spain as a case study, the authors suggest that one of the leading causes of changes in fire regimes in Mediterranean-type biomes in the Mediterranean basin was the implementation of state-led fire exclusion policies during the second half of the 20th century. These policies provoked the disruption of the pre-industrial anthropogenic fire regimes (PIAFRs) that had helped conform these anthropogenic biomes in the past. Fire exclusion policies were, in turn, an integral part of state-led industrialization development policies that provoked major transformations in pre-industrial land tenure structures, land use and fire use, thus re-shaping the local communities that generated PIAFRs and the anthropogenic biomes that they had sustained for hundreds of years. In the last few decades this gradual process of industrialization has been compounded with climate change to engender new types of Industrial Anthropogenic Fire Regimes (IAFRs) characterized by so-called megafires. This presentation will discuss the latest research conducted by the authors to examine this coupled human and natural systems hypothesis of fire regime change in Mediterranean-type biomes. The research is currently being conducted in selected municipalities of the Madrid Sierra, Spain, with uneven levels of social, political and industrial development with the goal of developing a spatially-explicit, integrated agent-based land use and fire simulation model to investigate drivers of these transitions.

Sensenig, Thomas

Since 1995, Thomas Sensenig has been the Southwest Oregon area ecologist for the U.S. Forest Service. Throughout his 31 year career with both the BLM and Forest service, Tom has served as forester, disease and insect pathologist, silviculturist, and ecological researcher. He has an extensive background in forest management, wildlife biology and fire ecology. Since 1995, Tom has been conducting fire ecology research throughout southwest Oregon. He has extensively investigated fire history in old-growth forests and how fire influences, species composition, rates of tree growth and mortality, stand density and wildlife habitat. Most recently, Tom and his colleagues have been monitoring the ecological effects of numerous south-

west Oregon fires, including the 2002 Biscuit fire.   B.S.   West Virginia University, Forest Management MS.   University of Washington, Forest Pathology and Entomology Ph.D. Oregon State University, Forest Science

Oral presentation, Wednesday, 3:50 PM, B114

Ten Year Anniversary of the Mega-Biscuit Fire

Ten Year Anniversary of the Mega-Biscuit Fire Thomas Sensenig, Patricia Hochhalter, Amy Nathanson   In 2002, the Biscuit Fire burned approximately 500,000 acres on the Rogue River-Siskiyou National Forest in southwest Oregon. Since then, the Forest Service Southwest Oregon ecologists have been monitoring numerous ecological processes impacted by the fire including: ongoing tree mortality, down wood accumulation, snag deterioration, regeneration, and herb and shrub cover. 85 of the long-term ecology plots, originally established for ecological classification in the 1970s, burned in the fire, providing an ideal opportunity for long-term monitoring of this exceptional event. These plots have been reassessed in 2003 immediately following the fire, in 2005, and again this year, the 10th anniversary. This lightning ignited fire started on July 13, and wasn't declared controlled until November 8, 2002. The long duration, exceptionally variable terrain, soil, and vegetation resulted in extraordinary diverse fire effects. This presentation will highlight the ecological diversity that was maintained and created by the vast spatial and extended temporal scales of this mega fire. We will present our observations, make comparisons and show examples of our seasons work across the numerous plant associations found in the area and across different fire severities.

Shaw, Nancy

Oral presentation, Thursday, 2:05 PM, B115

Native plant seedlings as a tool for restoring sagebrush ecosystems after fire

Shepperd, Wayne

Wayne D. Shepperd is currently a part-time Instructor at Colorado State University in Fort Collins, CO. He retired in 2007 from a 37 year career as a Research Scientist, at the U.S. Forest Service Rocky Mountain Research Station in Fort Collins, Colorado. He has authored over 120 scientific publications on the ecology, growth, and management of Rocky Mountain Forests. He holds a BS in Outdoor Recreation, and MS and Ph.D. degrees in Silviculture from Colorado State University.

Oral presentation, Tuesday, 3:25 PM, B117

Developing a guide to fuels treatment practices for ponderosa pine in the Black Hills, Colorado Front Range and Southwest: A Joint Fire Sciences Program success story

Historically, fire has been important in shaping the vegetation composition, succession, and structure of forests throughout the western United States. Low elevation ponderosa pine forests have been particularly vulnerable to altered fire regimes and much of the wildland-urban interface in the west is found among or adjacent to this forest type. Forest structure, fuels and fire behavior have changed in these forests in response to a century of forest management and fire suppression. Management practices to assist hazardous fuels treatment using mechanical treatments and prescribed fire are needed to address these problems. We developed a guide to fuels treatment practices in ponderosa pine forests in the Black Hills, Southern Rockies, and Southwest. This presentation will describe the techniques we used to combine information from existing literature with the expertise and experience of local practitioners into a comprehensive reference describing fuels treatment practices that are being successfully applied in these forests.

Sheridan, Rachel

Rachel Sheridan, Peace Corps Master's International Volunteer, United States Peace Corps, Northern Arizona University School of Forestry, Gerencia Estatal de la Comisión Nacional Forestal (CONAFOR), Tlaxcala, Mexico.   Rachel Sheridan is a Peace Corps Master's International volunteer studying at Northern Arizona University's School of Forestry. She is currently serving as a Peace Corps volunteer in CONAFOR (Mexico Forest Service) in Tlaxcala, Mexico. She is collaborating with an interdisciplinary team of local government officials, researchers, community leaders, and CONAFOR employees to integrate economic development with forest conservation in a rural and marginalized community that is in danger of losing much of its communal forest to anthropogenic fire.

Oral presentation, Wednesday, 2:05 PM, C126

Combining ecological and social science research to develop an integrated fire management plan in Pinus cembroides subs. orizabensis forests in a rural Mexican community

This research is part of a regional fire management strategy for Tlaxcala, Mexico that combines research, extension, and education. This project will be used to develop a fire mitigation plan for a pinyon pine species, the endemic Pinus cembroides subs. orizabensis found in southeastern Tlaxcala, through social and ecological diagnostic tools. This native species, which despite its commercially valuable seed, is on the verge of extinction in central Mexico mostly because of swidden agriculture practices. The social diagnostic will be conducted in a rural community that contains 475 hectares of P. cembroides subs. orizabensis forests, approximately two thirds of which have been affected by fire in the last 10 years. The diagnostic will identify and assess the social and economic barriers that affect fire management in rural and marginalized communities through interviews, workshops, and community meetings. The ecological diagnostic will be conducted through a fuel inventory and forest structure survey. The data will be used to develop a risk index using simulated fire behavior. The ecological risk of fire will be quantified and coupled with the social diagnosis to develop an integrated management strategy on how to reduce the risk of catastrophic, stand-replacing fires in P. cembroides forests in central Mexico. Combining applied ecological and social science research is an innovative strategy that addresses real world forestry problems and ensures that land managers and communities are equipped with a comprehensive toolset to effectively manage their forests. In order to develop effective land management plans, the communities that directly depend on the land for subsistence must be included in any planning or decision-making process. Combining both social and ecological diagnostic tools provides a more comprehensive understanding of the actual risks to forest conservation in these communally managed lands, as well as identifies more realistic and feasible community-supported options for conservation.

Sherriff, Rosemary

Rosemary Sherriff is an Associate Professor in the Geography Department and an affiliate faculty member in the Department of Forestry and Wildland Resources and in the Environmental Studies Program at Humboldt State University. Her primary research focus is on understanding past and present effects of climate change and disturbance (e.g., wildfire, insect outbreaks, forest management practices, wildland-urban interface) on forest ecosystems with relevance for current and future land-use management in western North America.

Oral presentation, Wednesday, 11:25 AM, B112

Comparison of past, present and future fire potential in montane forests of the Colorado Front Range

A driving factor for fuels reduction is the belief that increases in woody biomass over the last century have resulted in a greater risk of severe wildfire. In this study, we compared spatial models of present-day wildfire potential and historical fire severity in a >70,000 ha study area in the Colorado Front Range across elevations of 1800-3000m that includes ponderosa pine, ponderosa pine-Douglas-fir and mixed conifer cover types. We constructed models of wildfire potential (fireline intensity and crown fire behavior) under average (50th percentile) and extreme (99th percentile) fuel conditions. We then compared these models to observed fire severity in large fires since 2002 and a spatial model of historical fire severity. The model of historical fire severity was based on data from 232 fire history-age structure sites in which abiotic variables were used to predict the spatial variation of historical fire severity across the study area. We also evaluated how fuel conditions under average and extreme conditions compare to predictions under future climate change scenarios. Overall, the wildfire potential models were consistent with the severity of recent wildfires measured by remotely-sensed imagery for moderate and high load fuel types. Under the extreme present-day fuel conditions, approximately one-third of the area exhibited the potential for low-severity (surface) fire and two-thirds showed the potential for mixed-severity (torching to crown) fire. The preliminary results indicate strong spatial coincidence of reconstructed fire regimes and modern fire potential: high wildfire potential today is associated with mixed-severity fire historically (>80% overlap). Our preliminary results indicate <20% of the area has shifted from an historical low-severity fire regime to present-day risk of higher severity even under extreme weather conditions. The areas of greatest change are at low elevation, and along the plains-grassland ecotone, where there have been substantial changes related to anthropogenic disturbances.

Shindler, Bruce

Bruce Shindler, Professor Oregon State University Shindler is the team leader of this international project involving researchers and resource professionals in Australia, Canada, and the U.S. For the last 14 years his work has focused on forest health and wildland fire management, particularly the interactions between agencies and citizens in planning and decision-making. He has been a team leader on numerous projects for the Joint Fire Science Program and the National Science Foundation. He was lead author of the book Two Paths to Sustainable Forests: Public Values in Canada and the United States.

Oral presentation, Wednesday, 2:30 PM, B117

Agency-Stakeholder Trust in communities at Risk of Wildfire: Planning Strategies from Australia, Canada, and the United States

Agency-Stakeholder Trust in Communities at Risk of Wildfire: Planning Strategies from Australia, Canada, and the United States   Bruce Shindler and Christine Olsen, Oregon State University, United States Sarah McCaffrey, USFS Northern Research Station, United States Emily Sharp and Allan Curtis, Charles Sturt University, NSW, Australia   Tara McGree, University of Alberta, AB, Canada Bonnie McFarlane and Amy Christianson, Natural Resources Canada, AB, Canada Wildfires have increased in frequency and severity in many countries around the world, causing considerable environmental, economic and social consequences to fire-prone communities in recent years. As a result, fire management agencies face ever-growing complexity in their management decisions and interactions with the public. Successful interactions most often depend on trustworthy relations among affected stakeholders, particularly agency personnel and property owners at the wildland-urban interface.   Pre-fire and post-fire planning are critical periods—they provide essential opportunities for agency manages and stakeholders to come together to reach agreement on local solutions.   In this presentation we describe the collaborative work of our team of researchers from Australia, Canada, and the U.S. who have been engaging agency personnel and landowners about their efforts for making sound decisions in fire management. Our research now directly focuses on how trust is built in communities for reaching agreement on plans and projects that protect local resources. We have developed a planning framework that outlines factors influencing trustworthy relationships and organizes trust-building strategies as a guide for agency personnel and stakeholder groups. An innovative aspect of this research is an assessment model that incorporates researchers, managers, and community leaders in an evaluation process to ground-truth key components of this work. We are conducting these assessment workshops in each country during the fall of 2012 and will incorporate findings into our presentation of the planning framework at the conference in December.

Shive, Kristen

Kristen L. Shive Research Assistant School of Forestry, Northern Arizona University, Flagstaff, Arizona M.S. Forestry, May 2012

Oral presentation, Thursday, 4:15 PM, B114

Pre-fire fuel reduction treatments influence plant communities and exotic species nine years after wildfire

Climate change has been linked to increases in wildfire activity in many regions of the world, and such changes to historic disturbance regimes may significantly impact native vegetation. In the southwestern U.S., this trend is exacerbated by 21st century suppression policies that have created dense ponderosa pine forests susceptible to large, stand-replacing fires. These fires are a significant departure from the evolutionary history of frequent, low severity surface fires in ponderosa pine forests. We used a multi-year dataset from the 2002 Rodeo-Chediski Fire to detect post-fire trends in plant community response in east-central Arizona. Within the burn perimeter, we examined the effects of pre-fire fuels treatments on post-fire vegetation by comparing paired thinned and unthinned sites on the Apache-Sitgreaves National Forest in 2004, 2005 and 2011. There were significant differences in pre-fire thinned and unthinned plant communities by species composition and abundance in 2004 and 2005, but these communities were converging in 2011. Total plant cover was significantly higher in unthinned areas for all three years. Plant cover generally increased between 2004 and 2005 and markedly decreased in 2011, with the exception of shrub cover which steadily increased through time. The sharp decrease in forb and graminoid cover in 2011 is likely related to ongoing drought. Annual/biennial forb and graminoid cover decreased relative to perennial cover through time, consistent with the initial floristics hypothesis. Exotic forb and graminoid cover was generally quite low (<2.5%); however, several exotic species increased in frequency and the relative proportion of exotic to native cover also increased through time. These later trends may be cause for concern, as they may facilitate more significant invasions in the future. Overall, pre-treatment fuel reduction treatments helped maintain foundation overstory species and associated native plant communities following this large wildfire.

Sicafuse, Lorie

Lorie Sicafuse is a Doctoral Candidate in the Interdisciplinary Social Psychology Program at the University of Nevada, Reno. She is currently the Coordinator of the National Evaluation of the Joint Fire Science Program Regional Consortia.

Oral presentation, Tuesday, 11:25 AM, B111

Initial Findings from a Cluster Evaluation of the Joint Fire Science Program Regional Consortia

This presentation will highlight the initial findings of an external evaluation of the Joint Fire Science Program (JFSP) regional consortia. Guided by a Logic Model framework, this evaluation employs a mixed methods approach to measure consortia outcomes and impacts. Specifically, it aims to assess consortia progress toward their shared goals of improving the dissemination and application of fire science research, increasing communication and collaboration between fire science researchers and practitioners, and coordinating fire science delivery efforts. We will begin with a brief overview of the purpose and design of this ongoing cluster evaluation. Next, we will narrow our focus to two main components of the evaluation. The first main component consists of a web-based survey, which is disseminated annually by JFSP regional consortia to a large sample of fire managers/practitioners, fire researchers/scientists, and community members/policy makers. This survey collects quantitative data to measure progress toward general consortia goals, the efficacy of educational activities, and the strengths and gaps of the JFSP. The second main component of the evaluation involves the bi-annual collection and analysis of both quantitative and qualitative webmetrics data pertaining to individual consortium websites. These websites are designed to facilitate the dissemination of fire science information to fire practitioners and the general public, as well as to build relationships among fire science professionals and increase involvement in regional consortia activities. This presentation will explore the most critical findings derived from the web-based survey and webmetrics components, including any notable trends emerging from comparative analyses of annual data. Implications of these findings for both the continuing evaluation and JFSP programming will be discussed. We will conclude with a brief discussion of lessons learned thus far and subsequent future directions for this national cluster evaluation.

Sieg, Carolyn

Carolyn is Research Ecologist in the Forest and Woodland Ecosystems Science Program (Rocky Mountain Research Station). Most of her research focuses on understanding how natural processes such as fire and bark beetles shape ecosystems, and on developing management options for introducing these processes into altered systems without severe impacts such as enhancing populations of exotic plant species. She is also a member of a multidisciplinary team exploring the use of physics-based fire models in explaining unexpected fire behavior in highly variable fuels such as forests riddled with dead trees following bark beetle outbreaks.

Oral presentation, Tuesday, 3:25 PM, B115

Modeling fire propagation in highly variable pinyon-juniper woodlands following a drought-induced bark beetle outbreak

We used a physics-based model, HIGRAD/FIRETEC, to explore fire propagation relative to time-since-outbreak in pinyon-juniper woodlands following drought-induced bark beetle attacks and subsequent tree mortality. Pinyon-juniper woodlands are highly variable, but trees often are clumped, with sparse patches of herbaceous and shrubby vegetation scattered between clumps. A recent drought-induced bark beetle attack resulted in widespread mortality of pinyon trees across the Southwest. The presence of dead trees intermixed with live junipers raised concerns about increased fire hazard, especially immediately after the trees died and dead needles remained in the trees. We used FIRETEC to explore the coupled fire/vegetation/atmospheric interactions under low and high wind speeds in an attempt to identify thresholds associated with extreme fire behavior in these highly heterogeneous woodlands. We were also interested in how these interactions changed in woodlands without tree mortality ("live"), in the first year when dried needles clung to the dead trees ("dead"), and when the needles dropped to the ground ("dropped"). Our simulations suggest that fire propagation increases three-fold at low wind speeds (4 m/sec at 10-m height) when dead needles are on the trees compared to live woodlands and simulations with dead needles on the ground. At high wind speeds (7 m/sec), fire propagation in woodlands with dead needles on the trees increased only slightly above that in live woodlands or those with needles on the ground. This study suggests that the fire/vegetation/atmospheric interactions are complex across high spatial and temporal heterogeneity following a drought-induced bark beetle mortality event.

Silverstein, Robin

Robin P. Silverstein is an Ecologist with the USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Lab in Missoula, MT. He has worked on fire-related landscape ecology for RMRS since 2001, with additional graduate studies in wildlife biology and public health.

Oral presentation, Tuesday, 1:15 PM, B110

Simulating future wildfire risk in the wildland-urban interface in Flathead County, Montana

FIRECLIM refers to the National Science Foundation funded project assessing and adaptively managing wildfire risk in the wildland-urban interface for future climate and land use changes. Within the FIRECLIM Project, FireBGCv2, a landscape

simulation model, was used to examine the effects of climate change, vegetation dynamics, and wildland fire management on future burn probabilities. The FireBGCv2 modeling landscape included over 1 million hectares centered on western Flathead County, Montana. FireBGCv2 outputs were used as inputs into a large fire simulation system (FSim) to generate burn probabilities. These burn probabilities were then used in an economic risk model of structures burning in a wild-fire in an agent-based modeling approach. Extensions of the FireBGCv2 model included exploring the effects of climate change, fire suppression, and fuel treatments on future changes to Lynx habitat in a portion of the modeled area. Lynx habitat was surprisingly most impacted by reducing fire suppression, largely due to increased fire frequency removing the early seral stage lynx and their primary prey, snowshoe hare, favor. Accessing vulnerability of different fire management scenarios to climate change was also conducted. Results indicate which levels of suppression and fuel treatments change future burn probabilities on the landscape. An educational component of the FIRECLIM project was based on model-ing different scenario outcomes with FireBGCv2 and incorporating them into newly developed FireChoice self-learning software. FireChoice compares choices in vegetation management and land development, under differing environmental conditions of current versus a warmer, drier climate. Outcomes of decisions made by students will include visualization of changes in burn probability, changes in wildlife habitat suitability, and economic losses. This work demonstrates a method of giving a view into the future of vegetation conditions on a large landscape, considering climate change and management actions, as well as fire dynamics.

Singh, Randeep

Name: Randeep Singh Affiliation: G.B. Pant Institute of Himalayan Environment and Development   Singh, R. et al.(2009) Development of Tiger Habitat Suitability Model using Geospatial Tools – A case study in Achanakmar Wildlife Sanctuary (AMWLS), Chhattisgarh India. Environmental monitoring and assessment, 155, 555-567.   Singh, R. et al. (2011). Survival of dispersed orphaned tiger cubs (Panthera tigris tigris) In fragmented habitat of Ranthambhore Tiger Reserve In India. Indian Forester, 137(10), 1171-1176.

Oral presentation, Thursday, 11:25 AM, C125

Modelling forest fire risk zone for the management of fire in tropical dry deciduous forest, India

The forest fires are the most destructive factors and a real ecological disaster for many tropical forested regions causing, loss of life and habitat for many endemic and endangered faunal species. The forest fire cannot be control, but can be managed by minimise the frequency of fire to map forest fire risk zones, where fire likely to start and its spread areas. We studied the behaviour and to 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 recur-rent forest fires and harboring many endangered faunal species including largest predator (i.e. tiger) of India-Subcontinent. We used vegetation type, drainage, slope, aspect, elevation, human disturbance as a predictive variables for modelling forest risk zones. We used MAXENT algorithm to delineate factor responsible for fire and predicting forest fire risk zones. 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 and aim to enhance the local forest management and conservation plans. Our predictive model is able to identify forest fire risk sites of the study area and found to be in strong agreement with actual fire-affected sites. This study provides critical spatial information of increased forest fire threat in tropical dry deciduous habitat region and long term planning for forest fire management is necessary for effective conservation of biodiversity.

Skinner, Carl

Carl Skinner is a research Geographer in the Fire and Fuels Research Program, USDA Forest Service, Pacific Southwest Research Station (PSW) in Redding, California. He worked in fire management from 1968 to 1988 on the Lassen and Shasta-Trinity National Forests. He transferred to PSW Redding in 1988 to do research in fire ecology and management. His research with PSW focuses on understanding how fire, climate, and management activities interact to influence short and long-term forest vegetation dynamics.

Oral presentation, Thursday, 3:50 PM, B114

Fire history of the Ashland Watershed, Siskiyou Mountains, Oregon

We are studying the fire history of the 14,000 acre Ashland Watershed as part of a project designed to better understand the long-term development of Mediterranean mixed conifer/hardwood forests in southwestern Oregon. We have cross-

dated 809 fire scars between 1600 and 1920 C.E. from 96 samples collected on 12 sites across the watershed. Median fire return intervals (FRI) for these plots ranged from 4 to 15yrs. The mean FRIs ranged from 5 to 13 yrs (grand mean 10 yrs). Intra-ring scar position was determined on 480 (59%) scars. Interestingly, growing season scars were more prevalent than in areas studied in northwestern California: 29% earlywood, 47% latewood, and 24% ring boundary. Using pre-whitened indices, we compared fire activity to PDSI, ENSO, PNA, and two indices of temperature using cross-correlation analysis. There was a significant correlation (p<.001) with drought (-PDSI) in the fire year and with a positive PNA (p=.05) two years previous. No correlation was found between fire activity and ENSO or temperature. Fires appeared to have been confined by topography to a lesser degree than in northwestern California. Of the 108 fires between 1600 and 1920, 47 (43.5%) scarred trees on at least three sites. Of the 20 fires detected west of the West Fork Ashland Creek, only 2 were confined to the west side of the creek. Of the 27 fires detected east of the East Fork Ashland Creek, only 6 were confined to the east side of the creek. Additionally, fires that scarred at least 3 sites occurred on average every 4.8 yrs (median 3 yrs). The high frequency of relatively widespread fires suggests that many of the fires may have originated external to the watershed. They likely may have burned into the watershed from the adjacent Rogue Valley, largely occupied by oak/grass woodland.

Smail, Tobin

Tobin worked seasonally as IA fire/fuel on the USFS Helena NF 1995 to 1999. From 2000 to 2004 Tobin accepted a fire/fuel co-op position with the USFS that started with Logan Hotshots Wasatch-Cache NF and on to Forester/Fuels Specialist Lolo NF. Tobin graduated 2001 with a B.S. from University of Montana in forestry. From 2004 - 2005 Tobin detailed to the S.O. Lolo NF as a Fire Planner and R1 Office as Fire GIS specialist while pursuing a second B.S. in computer science. From 2005 - present Tobin worked for RMRS Missoula Fire Science Lab as Fire/Fuel GIS Specialist, USFWS R1 Office as Fuel Management Specialist, and currently Fire/Fuel GIS Specialist (SGT, Inc.) Contractor to the USGS Earth Resources Observation and Science Center all under the LANDFIRE project fire/fuel team.

Oral presentation, Wednesday, 2:05 PM, B110

LANDFIRE Fuel Attributes Layer Development, This presentation will provide spatial fuel analysts an evolutionary assessment on the development of LANDFIRE (LF) fuel attributes. Reviewing the progression of LANDFIRE fuel data layers will point out critical junctures, important user input, processing procedures, and the strengths and weaknesses of the current data suite. LANDFIRE has produced three iterations of spatial fuel layers, LF National (ver.100), LF 2001 (ver.105), and LF 2008 (ver.110). This assessment will focus on these three versions and the important issues, mechanics, concepts, and processes used in the development. This presentation also provides a glimpse at processes being instituted and considered for the future versions and revisions of these data.

Smith, Jane E.

Jane E. Smith Research Botanist Pacific Northwest Research Station   Research in my lab explores the impact of severe wildfire and timber harvesting on soil bacterial and fungal communities and other measures influencing soil productivity. Such information is essential to fine-tune post-fire treatment methods and speed the forest recovery process. Jennings TN, Smith JE, Sulzman EW, Cromack K Jr., McKay D, Caldwell BA, Beldin SI. 2012. Impact of postfire logging on soil bacterial and fungal communities and biogeochemistry in a mixed-conifer forest in central Oregon. Plant Soil 350(1): 393–411.

Oral presentation, Thursday, 2:30 PM, C120

Soil nutrients reduced, soil microbes undaunted by postfire salvage logging

It is well established that severe wildfire negatively impacts soil nutrient pools; however, the effect of postfire timber removal on soil productivity is not well understood and its application remains controversial among land managers, scientists, and the interested public. Postfire logging recoups the economic value of timber killed by wildfire, but whether such forest management activity supports or impedes forest recovery in stands differing in structure from historic conditions remains unclear. The aim of this study was to determine the impact of postfire logging on measures influencing soil productivity. We compared soil bacterial and fungal communities and biogeochemical responses of 1) soils compacted, and 2) soils compacted and then subsoiled, to 3) soils receiving no mechanical disturbance, across seven stands in a mixed-conifer forest in central Oregon, 1-3 years after postfire logging. Soil strength of the sandy loam volcanic soils was greatest in the compacted treatment and least in the subsoiled treatment. Compaction decreased plant-available nitrogen (N) on average by 27% compared to no mechanical disturbance, while subsoiling decreased plant-available phosphorus (P) on average by 26% compared to the compacted and non-mechanically disturbed treatments. Neither bacteria nor fungal richness significantly differed among treatments. A shift in bacterial communities corresponding with an increase in plant available N

and P suggests that soil microbes in these postfire landscapes are resilient to mechanical disturbance. Results suggest that nutrients critical to soil productivity were reduced by mechanical applications used in timber harvesting, yet soil bacteria and fungi, essential to mediating decomposition and nutrient cycling, appeared resilient to mechanical disturbance. Management decisions about whether or not to harvest fire-killed trees should be balanced with the recovery potential of a site, and the potential for high densities of fire-killed trees to increase the area of severely burned soil in the event of future fire.

Smith, Jane Kapler

Jane Kapler Smith, Ecologist at the Fire Sciences Laboratory in Missoula, MT, is manager of the Fire Effects Information System (FEIS) and a technical editor for 3 volumes in the "Wildland Fire in Ecosystems" (Rainbow) series. She develops communications programs relating to wildland fire, including the FireWorks educational trunk and curriculum. She has studied fire behavior and fire effects in aspen stands of north-central Colorado, taught biology and biostatistics, and conducted research on succession and acid rain in the hardwood forests of western New York. Jane has a B.A. from Alverno College, Milwaukee, Wisconsin and an M.S. in Forest Ecology from Colorado State University.

Oral presentation, Tuesday, 3:50 PM, B111

Syntheses: Improving Relevance and Usefulness for Managers

What constitutes a high-quality synthesis for wildland managers and field practitioners? Fire managers often request syntheses, and the research community has responded by publishing syntheses at both regional and national scales, but these products may not serve managers as well as possible. This project has used literature from many disciplines and interviews with scientists and managers to determine methods for producing a scientifically sound synthesis with maximum usefulness for managers. Several steps are essential for developing a high-quality synthesis: Articulate the focus question collaboratively at the outset of the project; determine the best, unbiased methods for the information search; organize information with regard to the focus question, emphasizing management implications; write concisely and directly, documenting thoroughly and minimizing jargon and acronyms. Finally, packaging of the synthesis is crucial and may require creative approaches such as callouts and layering of information with links to greater levels of detail. Skill is needed not only to produce a good synthesis but also to read one and apply it to management, so this project is also producing a tutorial on the skills needed to read a synthesis critically and efficiently.

Smith, Jane Kapler

(See biographical information, above.)

Oral presentation, Wednesday, 1:15 PM, B115

Relationships between fire and western invasive plants in the Fire Effects Information System

The Fire Effects Information System (FEIS) synthesizes information on basic biology and fire effects for more than 100 species of invasive plants occurring in the western United States. FEIS reviews are based on published literature supplemented by expert knowledge. They synthesize the information available and also identify knowledge gaps regarding species' relationships to fire. Knowledge gaps and limitations common in reviews of invasive species include assertions not clearly supported by field observation and lack of research extending more than a year or two after fire. A new user interface for FEIS now enables users to search for invasive species that could potentially occur in a given state or ecosystem. Work is underway to integrate information on historical fire regimes into all FEIS species reviews.

Smith, Max

Max Smith has been a contractor with the US Forest Service Rocky Mountain Research Station since completing his MS in Zoology at the University of Oklahoma in 2005. He is a co-recipient of the 2012 Forest Service Wings across the Americas Research and Partnership Award and his research is currently focused on modeling long-term effects of wildfire on riparian forests. When not studying trees, he travels with his wife to bird watching sites throughout the Pacific Northwest. Their first book on the subject will be published in 2013.

Oral presentation, Wednesday, 3:25 PM, B115

A burning question: does wildfire interact with invasive plants to reduce the reproductive success of riparian-nesting birds?

Nonnative plant invasions are among the top threats to wildlife habitat. In some areas, nonnative species provide fewer nesting and foraging opportunities for birds than native plants. In addition, nests constructed in nonnative plants may be

more vulnerable to predation or brown-headed cowbird (Molothrus ater) parasitism. Studies examining effects of Russian olive (Eleagnus angustifolia) and saltcedar (Tamarix spp.) on reproductive success of riparian-nesting birds have generally produced mixed results. Several species of birds successfully nest in these invasive woody plants, but native trees such as cottonwoods (Populus spp.) support greater numbers of species and nesting guilds. Along the Middle Rio Grande in central New Mexico, these dynamics are complicated by the increasingly frequent occurrence of wildfire. Moderate and high severity fires kill the above-ground tissues of cottonwoods and other trees, thereby decreasing nest site availability for canopy and cavity-nesting birds. Russian olive and saltcedar resprout vigorously following fire and provide nest sites with rates of nest survival similar those in unburned areas, but with increased rates of brood parasitism. These findings indicate that, along flow-restricted streams such as the Middle Rio Grande, wildfire will decrease breeding bird productivity if cottonwoods and other native trees are replaced by nonnative species.

Spies, Thomas

Thomas Spies is a Research Ecologist at the USDA Forest Service, Pacific Northwest Research Station, in Corvallis, Oregon, where he is team leader of the Landscapes and Ecosystems Team in the Ecosystem Processes and Function Program. He is also a courtesy professor in the Department of Forest Ecosystems and Society in the College of Forestry at Oregon State University. His research interests include, old-growth forest ecology and conservation, wildlife habitat relationships, landscape ecology, fire ecology, and integrated regional models of policy effects. He is editor of the 2009 book "Old-growth in a New World: A Pacific Northwest Icon Reexamined", which explores the social, ecology and policy dimensions of old-growth forests.

Oral presentation, Wednesday, 11:00 AM, B113

Fire-Prone Landscapes as Coupled Human and Natural Systems: An Example from the Eastern Cascades of Oregon

Policies that pertain to wildfire are typically based on dividing the fire-prone landscape (FPL) into a "wildland-urban interface" (WUI) under the influence of local fire management agencies and a fire-prone wildland under the influence of land managers. These two fire worlds are often seen as socially, economically and ecologically separated, yet, they are clearly part of a single interconnected coupled human and natural system (CHANS). Lack of understanding of these connections can lead to policies that are suboptimal or maladaptive. For example, emphasis on protecting property in the WUI can in some cases draw limited resources away from necessary ecological restoration work in wilder parts of the landscape. A multidisciplinary team of researchers is working on a project titled Forest People Fire (FPF) that uses systems models, integrated research, and collaborative learning to improve our understanding of adaptation in FPLs in central and southern Oregon. We have developed a conceptual model to guide empirical studies and simulation of future scenarios. The FPF model is based on biophysical and socio-economic interconnections across ownerships as well as feedbacks between the natural and human subsystems. Feedbacks from the human system to the natural system are more easily modeled than are feedbacks from the natural system to the human system. For example, we are able to model how homeowners and land managers manipulate vegetation to reduce risk of loss to high intensity fire. However, it is less clear how to model human responses to changes in forest conditions, perceived fire risk, and actual fire events. The FPF conceptual model suggests that slow or incorrect learning or poor dissemination of knowledge about the effects of vegetation treatments and/or wildfire suppression on forests or fire outcomes may limit the ability of humans to develop adaptive behaviors.

Steffens, Ronald

Ron Steffens has worked as a fire monitor at Grand Teton National Park beginning in 1992. He teaches environmental communications at Green Mountain College (VT) and serves as board member for the International Association of Wildland Fire and as chair of the Wildfire Magazine Editorial Advisory Board.

Oral presentation, Thursday, 11:00 AM, B113

Two decades of fuel moisture, wildfires and climate change: patterns and applications in the Tetons and southern Yellowstone ecosystem

For the past 20 summers, Grand Teton National Park has conducted a fuel moisture monitoring program with the goal of assessing potential fire severity based on comparative fuel moisture status. The monitoring program supports long-term management of naturally ignited fires and identifies increased wildfire risk for fire protection zones. While the program was not designed as a long-term climate assessment tool, the accumulated dataset of fuel moisture and the time period -- two decades that are keystone period of climate-change transition in the central Rockies -- allow us to explore two key questions: (1) Do sampled fuel moistures correlate with regional fire activity and thus serve as predictors of fire activity;

and (2) Do year-to-year fuel moisture trends correlate with weather patterns identified as more probable in climate-change scenarios?   The correlation of fuel moisture to fire activity has been primarily conducted with a pattern-recognition process, comparing current data with years featuring comparable fuel-moisture trends. Comparisons of fuel moistures with fire-season activity indicates variability in fuel moistures during moderate-activity fire seasons but discernible patterns during both low- and high-activity fire seasons.   We have also observed a trend toward extended seasons of fuel dryness and thus an increased availability of fuels for torching, spotting and other forms of fire spread. These extended seasons may be a marker of climate change in the Greater Yellowstone Ecosystem. The continued correlation of fuel moisture samples with fire activity provide an opportunity for long-term tracking of connections between climate, fire, and fuel availability. Continuing questions regarding regional and site-specific impacts of climate change suggest that operationally focused monitoring may wish to integrate evolving scientific queries, which would also provide guidance as we seek to apply best available science to fire management decisions.

Stephens, Scott

Scott Stephens, Professor of Fire Science at the University of California Berkeley. I have given testimony to the US House of Representatives three times on fire ecology issues.

Plenary talk, Thursday, 9:50 AM, Ballroom

Forest Fuel Reduction Treatments in the United States: Is there any Evidence of Ecological Harm?

Questions continue regarding if forest fuel reduction treatments cause ecological harm. A paper was written and published in BioScience in 2012 by a diverse group of authors to address this important issue. We found that current conditions of many seasonally dry forests in the western and southern United States, especially those that once experienced low- to moderate-intensity fire regimes, leave them uncharacteristically susceptible to high-severity wildfire. Both prescribed fire and its mechanical surrogates are generally successful in meeting short-term fuel-reduction objectives such that treated stands are more resilient to high-intensity wildfire. Most available evidence suggests that these objectives are accomplished with few unintended consequences, since most ecosystem components (vegetation, soils, wildlife, bark beetles, carbon sequestration) exhibit very subtle effects or no measurable effects at all. Although mechanical treatments do not serve as complete surrogates for fire, their application can help mitigate costs and liability in some areas. Desired treatment effects on fire hazards are transient, which indicates that after fuel-reduction management starts, managers need to be persistent with repeated treatment, especially in the faster-growing forests in the southern United States. Many managers are working hard to reduce fire hazards in forests in the western and southern US, current research demonstrates that these efforts are largely in line with the ecology of these ecosystems.

Stevens-Rumann, Camille

Camille Stevens-Rumann works for the University of Idaho as an Outreach Coordinator and Instructor in the Wildland Fire Program. She also does research on post-wildfire fuels and recovery as well as bark beetle-fire interactions for the university as a part of her PhD research.

Oral presentation, Thursday, 2:05 PM, B112

Challenges to understanding salvage logging: A case study from Arizona

Salvage logging is a hotly debated, highly controversial topic. From both an ecological and economic prospective, challenges relating to the study of salvage logging abound. We looked at changes in fuel loading, regeneration and stand structure after salvage logging on mixed-conifer forests. We studied salvage logging on the Warm Fire, which burned approximately 23,000 ha in 2006, and was cut 4 to 5 years post-wildfire in 2010-2011. We established fifteen, 2-ha logged and unlogged sites within the fire perimeter. We measured regeneration, surface and stand fuel characteristics before logging occurred in 2010, and re-measured four sites (and corresponding control plots) that were salvage-logged in 2012. Unlike other salvage logging studies, we found minimal differences between logged and unlogged sites in terms of fuel loading, regeneration of overstory species, and overstory snag characteristics. Regeneration was sporadic across at both salvage-logged and control sites. Coarse woody debris loadings increased on both logged and control sites in 2012 compared with 2010, with 26% higher mean loadings at control sites than salvage-logged sites. Additionally, snag density and basal area were slightly higher in control stands, though these differences were not significant. The lack of statistical differences may be due to several factors such as logging prescription, the interval between wildfire and cutting, or a paucity of study sites. While salvage logging is a highly debated topic, we present several reasons why studying these projects can be difficult and ways in which to mitigate these problems.

Stidham, Melanie

Melanie Stidham is a research associate with The Ohio State University, focusing on wildfire social science. Melanie studies risk perceptions, homeowner preparedness and mitigation, public perceptions of fuels management, wildfire evacuations, and communication/interactions during a wildfire event.

Oral presentation, Wednesday, 1:15 PM, B117

Community perceptions of fuels management in the wildland-urban interface

As frequency of uncharacteristically large and severe wildfires grows and the population in the wildland-urban interface (WUI) continues to increase, federal land managers are placing more emphasis on fuels reduction projects. Public support is critical to the successful implementation of these projects. In particular, homeowners in the WUI are a key constituency to the long term success of agency fuels programs. This presentation will provide information about citizen understanding of their fire risk, acceptance of agency fuels management practices, and confidence in agency managers to effectively reduce fire risk. The data presented here come from a longitudinal study of homeowners in five WUI communities in Oregon and Utah. The longitudinal nature of this research allows us to examine both current citizen responses and changes over time. Results indicate high, but shifting levels of support for thinning, understory mowing and prescribed fire, with some variations by community. Levels of support were correlated with levels of trust for land management agencies, providing further evidence for the importance of building and maintaining trust with local citizens.

Stitt, Susan

Susan Stitt is a physical scientist with the Geospatial and Environmental Change Science Center, US Geological Survey. She has over 30 years of professional experience in remote sensing, and geographic information systems, starting with a M.S. in remote sensing from the University of Michigan. She worked 15 years with the National Park Service and three years within the National Biological Service and then transitioned to the USGS. She was the principal author of the Biological Data Profile of the Content Standard for Digital Geospatial Metadata, worked on the USGS-NPS Vegetation Mapping Program, and the Land Use History of North America (LUHNA). Currently she is working on deriving an automated burned area algorithm from Landsat imagery.

Oral presentation, Tuesday, 1:40 PM, C125

The development of an automated burned area prediction algorithm based on Landsat imagery

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, known as Essential Climate Variables (ECVs). The Global Climate Observing System has developed formal specifications for ECVs that are technically and economically feasible for systematic observation. Fire Disturbance is one of 16 Terrestrial ECVs, and is defined as "burned area" supplemented by "active fires" and "fire radiated power" (FRP) measurements. Landsat's temporal resolution and sensor characteristics make it suitable for mapping burned area, but not suitable for monitoring active fires or FRP. Existing burned area products are based on twice daily MODIS data with a 500m cell size. Landsat, with a 30m or a historical 90m cell size would provide a finer spatial resolution product, with a trade-off in temporal resolution. The development of a burned area prediction algorithm for Landsat data is being undertaken by researchers at the USGS. The burned area ECV algorithm implements boosted regression trees to identify burned pixels in Landsat scenes using training data derived from the Monitoring Trends in Burn Severity database and Landsat surface reflectance. A series of validation sites across the U.S. with detailed fire perimeters have been selected for testing. Ultimately, the algorithm will be implemented on the Landsat image archive at the USGS. Current algorithm development efforts, initial results, and validation plans will be described.

Strand, Eva

Eva Strand is an Assistant Professor in the Department of Forests, Rangelands, and Fire Sciences at the University of Idaho. Strand's research focus on quantifying landscape change occurring at a variety of spatial and temporal scales, including global change, successional trajectories, disturbance events, expansion of invasive species, and change induced by humans. She has published widely in the area of quantitative modeling and geospatial applications in natural resource management. Strand has a BS in Chemical Engineering from the Royal Institute of Technology in Stockholm Sweden, an MS in Chemical Engineering- Systems Analysis, and PhD focusing on quantitative fire regime modeling from the University of Idaho. Strand teaches courses in geospatial applications in natural resources and fire science.

Oral presentation, Wednesday, 11:00 AM, C125

Remote sensing of burn severity along a sagebrush steppe/western juniper successional gradient

Western juniper (Juniperus occidentalis subsp. occidentalis) has been expanding into the sagebrush (Artemisia spp.) steppe over the past century in Idaho, Oregon, and California. Prescribed fire programs and wildland fire use are means of restoring sagebrush steppe and minimizing woodland development. Fuel characteristics and expected fire behavior change as sagebrush steppe is converted to juniper woodlands, however, little is currently known about how the post-fire effects are altered during the steppe/woodland conversion. During 2002-2004 pre-fire fuels and vegetation structure data was collected across the Owyhee Plateau in Idaho and vegetation structure maps were produced. Over 150 locations of pre-fire fuel and vegetation structure data are located within the Tongue-Crutcher wildland fire complex that burned 18,890 ha in 2007 with high intensity, providing a unique opportunity to evaluate the effects of pre-fire vegetation characteristics on post-fire physical, biological, and ecological effects from plot to landscape scale. Plot scale burn severity was evaluated with the Composite Burn Index (CBI) in locations where pre-fire vegetation data was available, while landscape scale burn severity was estimated via remotely sensed indices (dNBR and RdNBR). Significant relationships exist between CBI and remotely sensed burn severity indices. Woodlands in late structural development phases incurred higher burn severity than steppe and young woodlands, and sagebrush patches near developed woodlands incurred higher burn severity. These research results support the idea that a threshold exists for when juniper-encroached sagebrush steppe becomes difficult to restore. Implications for fire management in sagebrush/juniper ecosystems are discussed.

Suran, Byambagerel

Byambagerel Suran Phd Student at Forest and Rangeland Stewardship, Colorado State University since 2009, i am part of Collaborative Research: Fire, Climate, and Forest History in Mongolia Publication   1. Byambagerel S., Gordon C. Jacoby and Baatarbileg N. Reconstruction of insect outbreak frequency in Bogd Mountain, Mongolia using tree ring application. Abstract submitted to EURODENDRO 2008, Halltstatt, Austria. 2. Baatarbileg N., Byambagerel S. Air pollutioin influence on forest detected by dendro-chemical analysis (forested area near Ulaanbaatar). International Conference on Mountain Forests in a Changing World, Uni BOKU, Vienna, Austria 3. Baatarbileg N., Byambagerel S., Batchuluun Ts., Buyankhishig Kh. The first results of dendrochemical analysis in Mongolia, submitted poster abstracts for 7th international conference on dendrochronology, Beijing, 2006 4. Baatarbileg N, Byambagerel S, Uyanga A Wood identification of grave (13th century) from the Chinggis khan's golden horde, submitted poster abstracts for 7th international conference on dendrochronology, Beijing, 2006

Oral presentation, Tuesday, 3:50 PM, B112

Forest fire history of northeastern Mongolia

Wildfires are anticipated to increase and become more severe in forested areas around the world due to rising temperatures. In Mongolia in particular, mean annual temperature has increased by 2OC and forest and steppe fires have increased in temporal and spatial scales in recent decades. The main objectives of this study are developing a network of fire histories across Mongolia and identifying whether these historic fires were driven by climate or human activities. A total of 15 sites were chosen in Scots' pine (Pinus sylvestris L) dominated forest of Northeast Khentii Mountain Range in Mongolia. For the each site, 15- 20 partial cross sections were collected from fire-scarred trees, snags and stumps by targeted sampling approach. The historic fire events were reconstructed by crossdating annual tree rings and fire scars of collected cross sections. All sites had fire history that ranged from 250-450 years. Reconstructed fire events were recorded on a total of 209 samples from 1650-2009. Fires were quite frequent from 1800s-1940s, with the minimum fire interval of 6-7 years and mean fire intervals of 11-12 years from 1700-1900. Fire intervals changed to averages of 20-22 years after the 1920s. Fire seasons were identified (about 76% of total recorded fire scars), and 90% of them occurred in spring or early summer while 9% were in late summer or fall. Results from our research will provide baseline information for effective wildfire management at a regional scale in changing climate regimes in not only Mongolia but also other areas of the world.

Sutherland, Elaine

Elaine Kennedy Sutherland is a scientist with the Rocky Mountain Research Station in the Forest and Woodlands Program. She has been with Forest Service Research for 20 years, first with the Northern Research Station and then in her current Station. She is the Scientist in Charge of the Coram Experimental Forest. Her areas of expertise are in tree-ring analysis and forest restoration using prescribed fire and silvicultural approaches. While with the Northern Station, she initiated the program studying the utility of prescribed burning to restore oak forests, which then led to the fire and thinning project.

Oral presentation, Tuesday, 1:40 PM, B113

Drivers of mixed-severity fire in montane and subalpine forests of the northern Rockies

The fire regimes of forests in higher elevations of the northern Rockies (USA) are often described as severe or stand-replacing, depending on the scale the observer has in mind. In the context of entire headwater drainages (ca. 10,000 ha), we have found that mixed-severity fires are most typical, although severe fires do rarely occur. Differentiating these fire regime types is critically important to forest and fire management planning because the ecological and social effects of severe fires are significant and the potential for severe fire is increasing with changing climate. Here we re-evaluated the methodology that led to a potential mis-interpretation of past severe fire and more broadly, climate patterns that drive mixed-severity fires. We found that among 15 cross-dated mid-high elevation fire history sites in western Montana, long-term patterns of drought and hemispheric climate indices (PDO, PNA) were predictive of clusters of smaller, mixed-severity fires that may have limited the spread of past severe fire.

Swanson, Fred

Fred Swanson is a Research Geologist (emeritus) with the US Forest Service, Pacfiic Northwest Research Station and has specialized in disturbance ecology in the region's forests for 40 years and helped organize science-humanities collaborations for a decade.

Oral presentation, Wednesday, 2:05 PM, B111

Applying Humanities Perspectives to Wildfire Science, Policy, and Public Outreach

To achieve cultural change regarding wildfire, scientists, land managers, and politicians might consider partnerships with those who work in the world of the Humanities: environmental philosophers, sociologists, historians, artists, writers and poets. As Stephen Pyne put it, "if the fire-as-battlefield is a tired trope, there is no rival metaphor of equal stature to challenge it. We need at least one other, a complementary story of equivalent literary and moral power, and until controlled burning acquires such a narrative, fire management will never rally the public to the degree necessary to put its preaching into practice. Prescribed fire doesn't need a policy. It needs a poet." For the Humanities are where we explore what it means to be human: what we value, find worthy and beautiful. Perhaps most importantly in regards to wildfire, the Humanities can help us understand how culture shapes our perceptions and attitudes to the natural world; how narrative and metaphor and language can prove transformative; how competing values can be contextualized, clarified, and reconciled.   The Spring Creek Project for Ideas, Nature, and the Written Word has a ten-plus-year track record of bringing together creative writers, philosophers, environmental scientists and others to explore topics related to our relationship to the natural world. We have received a grant from the Joint Fire Sciences Program to determine practical options for and examples of ways the Humanities—alone or in collaboration with science and policy—may help encourage thoughtful and varied public engagement with fire issues.   Some examples and options include: • Creative residencies   • Conferences, workshops, and symposia   • Art-Science Collaborative Field Studies   • Community Programs and Partnerships   Though these were originally compiled for Joint Fire Science Program's Regional Consortia, they could be adopted by any organization or institution.

Syphard, Alexandra

Alexandra D Syphard is a research ecologist with the Conservation Biology Institute. Her background is in ecology and geography, and her research focuses on fire science and ecology, global change, and the interaction between human and natural disturbances and resulting impacts on humans and biodiversity.

Oral presentation, Thursday, 2:30 PM, B118

Land use planning to reduce housing loss to wildfire in southern California

Southern California is a Mediterranean-climate region with one of the largest areas of wildland-urban interface (WUI) in the US. Extensive housing development amidst highly flammable shrublands and annual Santa Ana winds set the stage for the nearly 10 000 structures that burned by wildfires since 2000. The primary strategy to alleviate fire hazard is wildland fuel reduction, with some focus on house characteristics and homeowner responsibility. Land use planning, however, has been overlooked as an alternative to fire risk reduction, despite large numbers of homes being constructed in the most hazardous areas of the landscape. We evaluated the role of land use planning for reducing housing loss to wildfire through analysis of existing structure loss data and simulation of future development scenarios. Using an extensive geographic dataset of residential structure locations, with more than 5500 burned by wildfire since 2001, we modeled and mapped structure loss as a function of explanatory variables that included housing pattern and location. Structures were most likely

to burn at low densities, in small, isolated neighborhoods, and when they were surrounded by wildland vegetation. Structure location relative to the coast and historic fire patterns were also significant. To project future housing loss, we applied an econometric subdivision model to three land use planning simulation scenarios characterized by: infill of existing development; expansion from existing urban areas; and leapfrog growth into undeveloped areas. After developing a fire hazard model conditioned upon existing structure loss data, we calculated probability of future housing loss. Leapfrog development was predicted to result in the highest structure loss, whereas infill development had a lower likelihood of burning. The importance of housing pattern and location in these analyses of past and future structure loss suggest that land use planning may be an important alternative for reducing wildfire risk in the WUI.

Taber, Mary

Mary retired from the Federal Government in June of this year, after 25 years with the National Park Service in Yellowstone, and six years with the Bureau of Indian Affairs at the National Interagency Fire Center. She received a Master of Natural Resources degree from the University of Idaho, where her Master's project focused on the use of a fire effects planning framework to evaluate the use of wildfirefire in whitebark pine stands in Yellowstone National Park. She continues to lead planning teams for complex long-duration wildfire incidents using the Wildland Fire Decision Support System.

Oral presentation, Wednesday, 1:15 PM, B116

Use of the Wildland Fire Decision Support System [WFDSS] for Implementation of the Greater Yellowstone Coordinating Committee's [GYCC] Whitebark Pine Strategy

Whitebark Pine is a keystone species in the Greater Yellowstone Ecosystem, providing ecosystem services ranging from snow capture and retention in high elevation watersheds to serving as a critical food source for grizzly bears. Throughout its range, whitebark pine populations are increasingly at risk of decline due to a warming climate, white pine blister rust infection, and intense mountain pine beetle infestations. The species has a complex and intricate relationship with fire—fire can prove beneficial or detrimental to the whitebark pine, depending on fire severity, stand structure and composition, and reproductive and disease-resistance status of individual trees. The Whitebark Pine Subcommittee of the Greater Yellowstone Coordinating Committee is comprised of representatives from the six National Forests and two National Parks within the Greater Yellowstone Ecosystem; its mission is to "work together to help ensure the long-term viability and function of whitebark pine in the Greater Yellowstone Area." In 2011, the Subcommittee published a strategy document, providing a basis for collaboration among federal land management agencies in the GYA in support of effective conservation of the species across administrative boundaries. Fire (wildfire and prescribed fire) is identified as both an important management tool in restoration and as a threat to high-value disease-resistant individuals. It is critical to the success of the strategy that fire be used and controlled thoughtfully and deliberatively in whitebark pine stands on this landscape. Our project focuses on the use of the Wildland Fire Decision Support System as a wildfire decision-making framework to support the Whitebark Pine Strategy. WFDSS allows preloading of critical resource values as spatial files that are available to wildfire managers and decision makers when evaluating a new ignition for effective management options. The evaluation can include comparison of likely or severe-case fire behavior scenarios and probability of fire spread.

Tarnay, Leland

Leland Tarnay, Air Quality Specialist, Yosemite National Park. Lee Tarnay meausures and reports on emissions from prescribed and wildfires and advises fire managers on atmospheric conditions for burning. Lee and the other co-authors have been studying the impact of prescribed fire and wildfire on carbon stocks and vulnerability in Yosemite and Sequoia and Kings Canyon National Parks.

Oral presentation, Wednesday, 2:05 PM, C120

Got Carbon? Primary Productivity and its vulnerability to fire in Sierra Nevada forests

Fire and climate dramatically shaped the structure and composition of Sierra Nevada forests; however, a century of fire suppression policy changed these vegetation attributes and the way fires burn today. Cool wet winters and hot dry summers of the Mediterranean climate are optimal for plant growth, and frequent ignition sources maintained forests in distinct fire regimes. Yosemite, Sequoia and Kings National Parks today have legislative support to allow fire to fulfill its ecological role and have actively managed fire on their respective landscapes. However, while the regulation of carbon emissions in California may impact management of Sierra Nevada forests, neither of the National Parks has evaluated the impact of fire management on carbon stocks. In this paper we present a spatial framework for assessing carbon stocks by forest type and evaluate the risk of those stocks to future fires. We use detailed fuels maps, fire history, and fire return interval departure

to evaluate standing carbon stocks and risk. We will also discuss on-going work to evaluate the impact of 40 years of fire management on carbon stocks at the landscape scale.

Taylor, Alan

Alan Taylor, Professor of Geography, Penn State. Dr. Taylor has conducted research and published extensively on the effects and interactions of fire disturbance, climate, topography and and people on forest structure and dynamics. His fire related research has been done in the Pacific Northwest, California and the American Southwest. Alan has served as Associate Editor for the Canadian Journal of Forest Research and he has been on the editorial board of Geography Compass and Physical Geography. He received his B.Sc. degree from California State University, Hayward; M.Sc. from Oregon State University, and Ph.D from the University of Colorado

Oral presentation, Wednesday, 3:50 PM, B117

Self reinforcing patterns of fire severity in a mixed conifer forest landscape, southern Cascades, USA.

Fire severity in pine and mixed conifer forests in California and the southwest has increased in the last few decades due in part to fuel build up. Increased fire severity has resulted in more severe fire effects in these ecosystems. In 2008, the Cub Fire burned the site of an earlier fire history study which described fire severity patterns in the 19th century. Since no logging has occurred on the site, differences in fire severity between the late 19th century and 2008 are related to fire history, vegetation structure, topography, changes in vegetation and fuels since fire suppression, and weather conditions during the fire. In this presentation we compare: 1) plot level fire effects (scorch and char height, % mortality, % basal area mortality) in 2008 with pre-fire plot level measurements of vegetation, fuels, topographic position, and day of burn; and 2) landscape fire severity patterns in 2008 derived from remote sensing to 19th century patterns from the fire history study. Plot level data indicate that the Cub Fire was severe. At the time of re-measurement, tree mortality and basal mortality was 79% and 60% respectively. Mortality was greatest when fire spread rates were high and in younger dense forests on upper slopes. At the landscape scale, fire severity in 2008 was greatest on upper and mid-slope positions and lowest on lower slope positions. This is the same slope position-fire severity pattern present in the 19th century landscape and indicates that, at least in complex terrain, topography has a strong influence on recurring patterns of fire severity and vegetation structure. In Cub Creek, fire severity patterns promote persistence of old forests with a multi-layered canopy in valley bottoms and on lower slopes and young dense forests on upper slopes.

Teske, Casey

Casey Teske, RS Image Analyst, National Center for Landscape Fire Analysis   Casey has worked in many aspects of wildland fire since 1993, and has been a Remote Sensing Image Analyst at the "Fire Center" since 2003. During the summer months, she can often be found on wildland fires, whether it is embedded with a fire module or creating maps at the Incident Command Post. When the fire season ends, she puts her remote sensing & GIS skills to work doing wildfire research. Additionally, she is very involved in helping connect students with internships and employment opportunities, specifically related to wildland fire. She completed her Ph.D. in Forestry at the University of Montana this past spring.

Oral presentation, Wednesday, 1:15 PM, C125

Using the Monitoring Trends in Burn Severity (MTBS) Data to Assess Characteristics of Fire-on-Fire Interactions in the Northern Rockies

In spite of the abundance of wildfire research, current knowledge about the interactions of old and new wildfires is not complete. Fire researchers and managers hold the assumption that previous wildfires affect subsequent wildfires, although characteristics of these interactions are only recently starting to have a presence in the research literature. This research focuses on understanding the influence of previous large wildfires on subsequent large wildfires in three Northern Rockies wilderness areas. Data products from the Monitoring Trends in Burn Severity (MTBS) project were used for the analyses. The combination of using wilderness areas and remotely sensed data allows an objective and consistent analysis of fire-on-fire interaction that is extensive in both time and space. Methods were developed, tested, and refined to describe, quantify, and compare once-burned and re-burned locations within the wilderness areas in terms of size, location, timing between fires, and severity. Using texture metrics, the complexity of the post-fire landscape was also assessed. Results suggest that while only a small fraction of each wilderness study area burns or re-burns, when a new fire encounters a previously burned area it re-burns onto it approximately 80% of the time. The diversity of the post-fire landscapes is greater than that of the pre-fire landscapes; however, landscapes generally become less complex if they have re-burned (compared to once-burned landscapes). Overall, results of this study confirm that previous fires do affect subsequent wildfires, albeit in different ways, within each wilderness area.

Thode, Andrea

Andrea E Thode (Andi) – Associate Professor of Fire Ecology and Fire Science in the School of Forestry at Northern Arizona University   Andi Thode grew up in Los Alamos, New Mexico. She completed her B.S. (1996) and later her Ph.D. (2005) in fire ecology through the Ecology Graduate Group at the University of California, Davis. She has been heavily involved in the Association for Fire Ecology (AFE) since its' inception. In 2001 Andi started working as a fire ecologist for the Pacific Southwest Region of the U.S. Forest. In 2005 she left the U.S Forest Service to work at Northern Arizona University (NAU). She is currently an associate professor of fire ecology and fire science in the School of Forestry at NAU. Her research focuses on fire effects, fire monitoring and landscape level fire severity effects. Andi is the PI for the Southwest Fire Science Consortium.

Oral presentation, Wednesday, 2:30 PM, C121

Patch Sizes and Severity: Results from the Southwest 2011 and 2012 Fire Seasons

Over the last two decades, dense forests and climate change related drought have greatly increased the number of large wildfires in the Southwest. This recently culminated with the 2011 and 2012 fire seasons in which the two largest fires in the recorded history of New Mexico and the largest in Arizona occurred. In 2011 alone, there were 24 fires greater than 10,000 acres, 8 fires over 50,000 acres, and 4 fires over 100,000 acres. Although the area burned has certainly increased, we examine how severity has changed over time. In particular we examine how high severity patch size has changed within major vegetation types in the last three decades. Using 28 years of Monitoring Trends in Burn Severity (MTBS) extended assessment data, and available Composite Burn Index (CBI) data we will present how burn severity and patch sizes within recent large fires compare to 28 years of fire in the Southwest. This information has tremendous implications for long-term post-fire recovery, landscape resiliency and post-fire management practices.

Thomas, Ian

Dr Ian Thomas is a palaeo-ecologist who is interested in the recent evolution of the Tasmanian landscape. The development of treelessness is an ecological condition that interests him especially in regard to anthropogenic influences. He has research interests in China, Turkey and the Republic of Georgia.   Dr Michael Fletcher is a palaeo-ecologist who has research interests in high latitude southern latitudes, especially Chile and Tasmania. The impact of fire on temperate rainforests and the role of climate from the last Glacial Maximum though the Holocene form the basis of his present research.

Oral presentation, Tuesday, 4:15 PM, B117

Fire history of Tasmanian sub-alpine coniferous forests: evidence of forest destruction and regeneration over the past 10,000 years.

This discussion will present fine resolution pollen and charcoal evidence for the timing of major fire events during the Holocene and the response of an important component of the sub-alpine forests of Tasmania to those events. Athrotaxis is a long-lived iconic coniferous genus endemic to western and central Tasmania. It has distant taxonomic affiliations with redwoods and other members of the Cupressaceae in south Asia and North America. The genus contains three species, A. cupressoides, A. selaginoides and A. laxifolia. All are extremely fire sensitive with their greatest extent found in the temperate rainforests of the Tasmanian World Heritage Area. A. cupressoides is mostly confined to sub-alpine locations where it forms a particularly spectacular component of the vegetation.   Since the early 1960's fire has caused major damage to at least 50% of the former extent of A. cupressoides with much recent effort expended in attempts to protect the species from further erosion of it's range. Members of the genus can all regenerate by seed or suckering but even quite mild fires can kill adult trees. Until now, the long-term response by Athrotaxis to disturbance has remained obscure. Here we present pollen and charcoal evidence to show that episodes of hill-slope instability and individual fire events are implicated in the both the destruction and survival of Athrotaxis within a landscape complicated by anthropogenic fire and an increasingly active El Nino and La Nina climate regime.

Thompson, Matthew

Matthew P Thompson is a Research Forester with the Human Dimensions Program of the Rocky Mountain Research Station, USDA Forest Service. His work focuses on the nexus of risk assessment, decision support, and economics, with a specific emphasis on contemporary wildfire management issues. His research supports the mission of the National Fire Decision Support Center, and he serves as a member of the National Science and Analysis Team for the National Cohesive Wildland Fire Management Strategy.

Oral presentation, Thursday, 1:40 PM, B117

Safe and effective response

The National Cohesive Wildland Fire Management Strategy is organized around three central themes: restoring and maintaining resilient landscapes, creating fire-adapted communities, and wildfire response. This presentation will focus on the latter category, with a specific focus on progress towards the goal that all jurisdictions participate in making and implementing safe, effective, and efficient risk-based wildfire management decisions. The role of collaboration, establishment of performance measures, and modeling efforts will be reviewed through the lens of three Cohesive Strategy core principles: (1) Reducing risk to firefighters and the public is the first priority in every wildland fire management activity; (2) Sound risk management is the foundation for all management activities; and (3) Federal, local, state, and tribal governments support one another with wildfire response.

Thompson, Matthew

(See biographical information, above.)

Oral presentation, Tuesday, 11:00 AM, C121

Applying a wildfire risk framework at national, regional, and forest-level planning scales – case studies and lessons learned

The financial, socioeconomic, and ecological impacts of wildfire continue to challenge federal land management agencies in the United States. In recent years policymakers and managers have increasingly turned to the field of risk analysis to better manage wildfires, and to mitigate losses to highly valued resources and assets (HVRAs). In recent years a common framework for assessing wildfire risk has emerged that is founded on analyzing the exposure of HVRAs to wildfire hazard (quantified with fire likelihood and intensity) and further analyzing the effects of fire to HVRAs. In this presentation I will present the fundamental components of a modeling process to quantify wildfire risk according this framework. The components include stochastic wildfire simulation, expert-based modeling of fire effects, and multi-criteria decision analysis to characterize relative importance across HVRAs. I will further review a number of recent applications of this framework and process on federal lands in the western U.S., and describe lessons learned and future opportunities.

Tiller, Michael

Michael B. Tiller, Graduate Student, Stephen F. Austin State University

Oral presentation, Thursday, 11:25 AM, C126

Effects of Chinese privet, Chinese tallow, and yaupon on surface fuel volatility in east Texas

Effects Of Chinese Privet, Chinese Tallow, And Yaupon On   Surface Fuel Volatility In East Texas   Michael B. Tiller[1], Brian P. Oswald[1], Alyx Frantzen[2], Warren C. Conway[1], and I-Kuai Hung[1]   [1]Arthur Temple College of Forestry and Agriculture and [2]College of Science and Mathematics, Department of Chemistry Stephen F. Austin State University, Nacogdoches, TX   Abstract   East Texas forest communities have undergone significant ecological changes in forest structure and composition as evidenced by the fragmented landscape and urban development within the region. Increasing occurrences of human and natural disturbances coupled with fire exclusion have provided the optimum biological pathway for the proliferation of invasive plant species that threaten biodiversity, ecosystem sustainability, and accumulation of flammable surface fuels. Current east Texas fuel models do not accurately reflect the increases of biomass resulting from the proliferation of Yaupon (Ilex vomitoria), Chinese privet (Ligustrum sinense), and Chinese tallow (Triadica sebifera) to local forest communities. Local fire managers rely on accurate fire behavior predictions from contemporary fire modeling software to meet ecological management objectives and wildfire planning in local communities. This study will investigate the changes in surface fuel loading by analyzing BehavePlus indices from a series of research sites representative of local fuel models with the inclusion of invasive species compared with current fuel models. In addition to fuel loading indices, a chemical analysis of target species volatile compounds will be evaluated utilizing oxygen bomb calorimetry, thermogravimetric analysis (TGA), and gas chromatography mass spectrometry (GCMS). Quantitative data from the combined lab procedures will address flammability variables outlined in previous studies that include effective heat of content (EHOC), reduction mass fraction (RMF), gross heat of combustion (GHC), activation energy, and ignition temperature indices.

Toman, Eric

Dr. Eric L. Toman is an Assistant Professor in the School of Environment and Natural Resources at The Ohio State University. He has been involved in research on the human dimensions of fire management since 2000 and has conducted studies across the United States. He recently served as the lead author of a compendium of social science research findings regarding prescribed and wildland fire.

Oral presentation, Wednesday, 11:25 AM, B117

Prescribed fire and endangered species: Manager decisions regarding the use of fire in critical habitat areas

The Endangered Species Act requires the development of recovery plans that describe management activities to recover population levels of listed species. These plans often emphasize management activities to maintain or restore critical habitat areas. Depending on the habitat requirements of the particular species and ecosystem within which it is found, managers may select from a range of potential interventions. However, the requirements of the Endangered Species Act increase the importance of ensuring that selected management activities do not result in negative impacts to listed species. Although some designated critical habitat areas occur in fire-adapted systems, the use of fire to achieve desired conditions may be viewed as less desirable due to potential uncertainty and risk with the outcomes of fire treatments. This presentation draws on a series of semi-structured interviews with scientists and management personnel from federal and state government agencies, non-governmental organizations and other key stakeholders involved in recovery efforts to examine the factors that influence management decisions regarding the use of fire to manage critical habitat areas. Findings describe the case of the Kirtland's warbler, a neotropical bird with nesting grounds in the northern great lakes region that relies on jack pine forests that were historically maintained by wildland fires. However, recovery efforts have relied primarily on mechanical methods to create suitable habitat conditions. While proving successful at recovering population levels, the mechanical interventions have also contributed to a range of unintended consequences. This case will be contrasted with that of the Red cockaded Woodpecker where recovery efforts have included extensive use of fire to develop and maintain habitat. Results provide insight into the psychological influences on the use of fire as a management tool, evaluation of tradeoffs with other ecosystem services, and potential challenges for the use of fire for species recovery.

Tracy, Shira

Shira Y. Tracy, Doctoral Student Department of Geography, University of Utah. Lab Manager at the Power Paleoecology Lab, Natural History Museum of Utah, Instructor, Research Assistant. Research interests: Late Quaternary paleoecology in Amazonia, linkages among vegetation, disturbance, climate and humans.

Oral presentation, Tuesday, 4:15 PM, B113

Late Quaternary Climate Controls on Fire in Neotropical Savanna Ecosystems

A 38,000-year sedimentary charcoal record of fire from lowland Bolivia provides a long-term perspective on disturbance in savanna ecosystems. Temperatures are predicted to increase by ~3ºC coupled with a precipitation to decrease ~20% during the 21st century. This will reduce plant water availability, intensify drought stress, and increase fire activity. The study site occurs along a climatically sensitive ecotone, in Bolivian cerrãdo savanna. This area has remained intact through late Quaternary climate variability including increased drought frequency and duration. Regional comparisons suggest millennial-scale linkages between fire, vegetation, and climate. Charcoal data from this site and nearby records suggests fire decreased during the glacial period, ~32,000-17,000 cal yr BP, followed by increased biomass burning during the early and middle Holocene,. Increased fire frequency during the early and middle Holocene was driven by climatic variability, while savanna vegetation remained constant. High-resolution charcoal records provide ecosystem analogs for conservationists, land-managers, and policy makers on cerrãdo savanna fires regimes during periods of increased warmth and drought stress as expected for the 21st century.

Trainor, Sarah

Sarah Trainor is Assistant Research Professor at the University of Alaska, Fairbanks and Director of the Alaska Fire Science Consortium. She also serves as Director of the Alaska Center for Climate Assessment and Policy and affiliated scientist with the Scenarios Network for Alaska and Arctic Planning. She has worked in boundary spanning and science communication in Alaska for over 5 years and is co-author on a recent publication highlighting JFSP Consortia needs assessments, "How Can We Span the Boundaries Between Wildland Fire Science and Management in the United States?" to be published in the Journal of Forestry.

Oral presentation, Wednesday, 11:00 AM, B111

In a Time of Change: The Art of Fire

As Alaska's climate changes, the frequency and severity of wildfires in the interior and south central regions are increasing as is the occurrence of tundra fires. Smoke often fills the summer skies, and extensive wildfires can pose risks to life, property and subsistence livelihoods. Because fire managers operate at the interface between ecosystem function, land management policy and the public, successful fire management lies not only in scientifically sound decision making and effective operations, but also in successfully engaging and communicating with Alaskan residents. The arts and humanities have a powerful capacity to create lines of communication between the public, policy and scientific spheres, as well as to contribute directly to the discourse. This presentation reports on a project that engages visual arts with fire managers and scientists to promote public understanding and awareness of the scientific basis behind fire management practices in the context of Alaska's changing ecosystems. Building on a growing network of professional artists, writers and scientists in Alaska, we provided field trips and hands on opportunities for professional artists to engage in and gleen inspiration from fire science and fire management. A variety of pieces in mixed media, fiber, painting, photography, wood sculpture and metal and fiberglass sculpture were displayed in a professional art show in August 2012, which attracted over 450 people for the opening in Fairbanks, Alaska. Public lectures by artists and fire ecologists on their inspiration and methods were held throughout the month. Works by community artists, including fire fighters, were also displayed at the Alaska Public Lands Information Center and Morris Thompson Community Culture Center. Preliminary results from a participant survey show strong support for visual arts as a mode public engagement and communication. The show will be on display at Alaska Pacific University in Anchorage throughout January 2013.

Turner, Monica

Monica G. Turner is the Eugene P. Odum Professor of Ecology in the Department of Zoology, University of Wisconsin-Madison. A native New Yorker, Turner earned her BS in Biology from Fordham University, and her PhD in Ecology from the University of Georgia. Turner's research emphasizes the causes and consequences of spatial heterogeneity in ecological systems and includes long-term studies of the 1988 Yellowstone Fires. She has published over 200 scientific papers, has authored or edited six books, and is co-editor in chief of ECOSYSTEMS. Turner was elected to the US National Academy of Sciences in 2004, and she received both the ECI Prize in Terrestrial Ecology and the Ecological Society of America's prestigious Robert H. MacArthur Award in 2008.

Plenary talk, Wednesday, 8:20 AM, Ballroom

Climate change may produce novel climate-fire-vegetation relationships in Greater Yellowstone during the 21st Century

Ecologists increasingly recognize that climate-induced increases in fire activity may catalyze rapid ecological change and contribute to regime shifts. However, the magnitude, timing and spatial patterns of anticipated changes are not well resolved at regional scales. Here, I synthesize recent studies of climate change, fire regimes, and vegetation in Greater Yellowstone (Wyoming, USA), a large, wildland landscape dominated by conifer forests and characterized by infrequent, high-severity fire. Greater Yellowstone is projected to become much hotter and drier with ongoing climate change, and recent studies suggest a novel fire regime is possible by the mid 21st Century. Large fires (> 200 ha) are anticipated to occur much more frequently than in the past 5,000 to 10,000 yrs. Years without large fires are expected to become rare with continued warming, and fire rotation is projected to shorten to < 30 yrs from the historical 100–300 yrs. Anticipating vegetation shifts in Greater Yellowstone under such novel climate-fire regimes is complex, but forest resilience could be compromised through at least three mechanisms. First, increased fire frequency could reduce postfire tree regeneration if fires recur before seed supply is replenished in developing stands; and reduce carbon storage if legacy wood from previous fires is combusted in the subsequent fire. Second, the occurrence of fire soon after a prior disturbance (e.g., bark beetle outbreak) could reduce postfire tree regeneration (and thus subsequent carbon recovery) if prefire seed supply was reduced. Third, warmer and drier conditions in the years after fire could depress postfire tree seedling establishment and subsequent carbon recovery, even with an abundant seed source. Modeling studies and field evidence following recent fires provide initial support for these mechanisms. Continued warming could completely transform fire regimes in Greater Yellowstone by the mid-21st Century, with profound consequences for many species and ecosystem services.

Umphries, Tara

Tara Umphries is a Fire Management Specialist for the Lincoln National Forest in New Mexico and a graduate student in the College of Forestry and Conservation at The University of Montana. She is a fire behavior modeler and decision sup-

port specialist for several fire incident management teams and is studying new approaches to fuels characterization and applied fire modeling.

Oral presentation, Tuesday, 1:15 PM, C122

Application of terrestrial laser scanning for quantifying grassland fuels across a range of heights and densities

Terrestrial laser scanning is increasingly being viewed as a source of spatially explicit 3-dimensional fuels data for validation of a new generation of fire behavior models. However, there is considerable uncertainty in how laser point clouds relate to fuel properties such as bulk density, height, and surface area to volume ratio. Here, we report on a tightly-controlled experiment using multiple laser scans of a homogeneous bunchgrass fuel bed of hard fescue (Festuca trachyphylla) that is systematically modified to vary height and density. The fuel bed was gridded, scanned from three perspectives, treated for height and density on a random sample, and scanned again. The remaining biomass was subsequently removed and the fuel bed was scanned a third time. By comparing field height and mass with laser height profiles and derived metrics across a range of treatments, we demonstrate the strengths and limitations of laser scanning for describing the amount, character, and spatial variability of fuels in a simple grassland.

Urbanski, Shawn

Shawn Urbanski is a research physical scientist with the Rocky Mountain Research Station at the Fire Sciences Laboratory in Missoula, MT. His research includes 1) emissions quantification and 2) field experiments for the validation of smoke emission and transport models. The emission quantification research involves laboratory and field experiments to characterize the composition and intensity of emissions from prescribed burning and wildfires in North America and the development improved wildland fire emission inventory methods. The model validation research includes the deployment of airborne instrumentation to acquire measurements of plume rise, chemical composition, and dispersion of smoke from wildfires and prescribed burns. The field measurements provide datasets to quantitatively evaluate emission estimates, plume rise models and high-resolution smoke dispersion forecasting models.

Oral presentation, Thursday, 2:05 PM, C122

An Emission Inventory for Western U.S. Wildfires: The Impact of Wildfire Specific Emission Factors

In the U.S. wildfires and prescribed burning present significant challenges to air regulatory agencies that struggle to achieve and maintain compliance with National Ambient Air Quality Standards and Regional Haze Regulations. Fire emission inventories (EI) provide critical input for atmospheric chemical transport models used by air regulatory agencies to understand and to predict the impact of fires on air quality. Fire emission factors (EF), which quantify pollutant emissions, are essential input for the models used to develop EI. The past decade has seen significant progress in quantifying EF for prescribed fires in temperate ecosystems. However, reliable EF for wildfires in temperate forests are extremely limited. During the western U.S. wildfire season the combination of low fuel moistures and high-intensity fire fronts can facilitate the consumption of large woody fuels and duff. Conversely, prescribed burning is generally characterized by low-intensity fire when the moisture of large woody fuels and duff are moderate, conditions which minimize consumption of these fuels. Since heavy fuels and duff tend to burn with lower combustion efficiency than fine fuels, wildfires are expected to have EF different from those of prescribed fires. In 2011 we deployed airborne chemistry instruments and measured the combustion efficiency and EF for wildfires in western U.S. The wildfires had lower combustion efficiency and higher EF (for smoldering combustion products) compared with those reported in prescribed fire studies and used in current EI. We use our wildfire combustion efficiency and EF to develop an improved EI for the western U.S. We find that the use of prescribed fire EF in current EI results in a sizeable underestimate of pollutant emissions for wildfires. Since these EI provide critical input for air quality modeling systems, we conclude that the regional scale air quality impact of wildfires is likely underestimated by air regulatory agencies.

US Forest Service Representative

Plenary talk, Friday, 10:20 AM, Ballroom

USFS approach to managing wildfire over the next 20 years

van Manatgem, Phillip

Phil van Mantgem is an ecologist working on topics including fire ecology, climate change effects and forest resources management.

Oral presentation, Thursday, 11:25 AM, B114

Climatic stress increases forest fire severity independent of fire intensity

Pervasive warming can lead to chronic stress on forest trees, potentially causing greater sensitivity (increased mortality) to fire-caused injuries. Longitudinal analyses from over 300 forest plots from across the western United States show that higher pre-fire water deficits substantially increase post-fire mortality probabilities. This climate-fire interaction was present after accounting for fire defenses and injuries, and was persistent across geographic regions, major genera and tree size. Warming trends have been linked to increasing probabilities of severe fire weather and fire spread; our results suggest that warming may also increase forest fire severity (the number of trees killed) independent of fire intensity (the amount of heat released during a fire).

van Wagtendonk, Kent

Kent van Wagtendonk is the Fire GIS Specialist for Yosemite National Park. He has been working for the NPS for 12 years, 8 as the Fire GIS Specialist. He supports the park Fire Management with incident Fire GIS mapping and fire ecology spatial data analyses. His interests are in fire spatial patterns of ignitions, and fire severity/vegetation interactions. He will be presenting van Wagtendonk et al. from Fire Ecology Vol 8 Issue1, 2012.

Oral presentation, Thursday, 2:30 PM, C125

Factors Associated with the Severity of Intersecting Fires in Yosemite National Park, California, USA

In 1972, Yosemite National Park established a wilderness fire unit in which lightning fires were allowed burn under prescribed conditions. This unit was expanded in 1973 to include the 16 209 ha Illilouette Creek basin, to the southeast of Yosemite Valley. From 1973 through 2011, there have been 157 fires in the basin. Fire severity data were collected on all 28 of those fires that were larger than 40 ha. The severity of the fires was associated with the fire return interval departure, the years since last burned, the severity of the previous fire, the number of times an area had burned, the weather conditions at the time of reburning, and the pre-fire vegetation type. The factors that were associated with reburn severity worked in combination with each factor, influencing some aspect of severity. Fire return interval departure affects vegetation density and composition changes. Years since last burned primarily affects surface and understory live fuels as they accumulate over the years. The number of times an area has burned affects fuel reduction. The weather conditions at the time of burning directly affect fire behavior, which directly affects fire severity. The role of pre-fire vegetation was also important in that when fire severity was unchanged, low, or moderate, the initial vegetation was usually maintained. However, when fire severity was high, a change to upper montane chaparral often occurred. The Illilouette Creek basin in Yosemite is one of the few areas where it is possible to see the effects of the long-term interactions of vegetation, fire, and climate. Managers and scientists can use this information to better understand the role fire plays in these ecosystems and how to best manage this dynamic ecological process.

Varner, J. Morgan

Dr. J. Morgan Varner is Assistant Professor of Forestry at Mississippi State University. Morgan has been engaged in prescribed fire councils for more than a decade, co-founded and directs the first council in the Pacific West, the Northern California Prescribed Fire Council, and is a Board Member on the Mississippi Prescribed Fire Council. He has researched, taught about, and ignited fires in the western and southeastern US.

Oral presentation, Thursday, 1:40 PM, B116

History, Accomplishments, and Challenges of Prescribed Fire Councils

Prescribed fire councils are organizations that encompass a great variety of stakeholders sharing a common vision. Few if any natural resource disciplines serve as a bridge across the same diversity of interests, permitting councils to be effective communicators of conservation. In this presentation I will discuss the origins of prescribed fire councils and their regional and national growth. The focus of councils is defined by their diverse stakeholders and the regional challenges and ecological processes. I will discuss effectiveness and success of councils as peer networks, science delivery mechanisms, policy review and development arenas, and as operational and logistical networks.

Varner, J. Morgan

Dr. Morgan Varner is on the faculty at Mississippi State University. His research focuses on understanding the mechanisms of fire effects in fire-prone North American wildlands. He co-founded and serves as Director of the Northern California Prescribed Fire Council and is a current Board Member of the Mississippi Prescribed Fire Council. He has served on AFE's Education Committee since 2005.

Oral presentation, Thursday, 3:50 PM, B113

Correlated fire-adapted traits in southeastern USA oaks

Fire is a common disturbance in southeastern USA terrestrial landscapes and has likely served as a strong selective force on many woody plant species in the region. Of woody species, the diverse oaks (genus Quercus) have traits that reflect their relationship with the fire-prone region. Oaks span a wide range of sites in the southeastern USA, from xeric ridgetops and sandhills to wet, seasonally inundated river bottoms and lake margins. The resultant fire regimes shaped distinct adaptations of oaks to fire, and oaks have in turn structured fire-adapted ecosystems. Here we synthesize evidence from the ecophysiological literature, laboratory and wildland fire experiments, laboratory drying experiments, and field observations to determine the collective traits associated with fire strategies in oaks. We use hierarchical clustering to combine these divergent traits into fire-related strategies for 11 native oak species in the region. For comparison, we contrast these results with those from fire-adapted pines from the southeast. Analyses revealed that these oaks cluster into pyrophytic, intermediate, and mesic species. Litter from pyrophytic oaks dries more rapidly, generates higher flames, accrues fire-protective bark more rapidly, and their crowns have greater light transmittance (to promote understory plant growth and reduce surface fuel moisture). Conversely, litter from mesic oaks dries more slowly, generates lower flames, invests less in bark, and their crowns have poorer light transmittance. In many cases, oaks and pines clustered together in fire syndromes. In spite of several clear fire adaptations, many fire and forest managers focus substantial resources to diminish or eliminate the presence of upland southeastern oaks. This synthesis will help clarify the relative pyrophily of southeastern oaks and aid more broadly in the understanding of fire-related traits.

Wadleigh, Linda

Linda Wadleigh is a Fire Ecologist for the USDA Forest Service in the Southwest. She has spend her career learning and teaching about fire's role in the United State's Western ecosystems.

Oral presentation, Wednesday, 1:40 PM, C121

When fire size is not the whole story - Fire severity in Southwestern United States large Fires.

The fire season of 2011 still stands as an historic one, both in number of fires and the number of acres burned, in the southwest. Following closely on its' heels, the fire season of 2012 saw the largest recorded fire in New Mexico's history, although overall numbers of acres burned in the Southwest were down from 2011. The media reports the total number of acres burned, possibly exaggerating the ecological impacts, not adequately reflecting fire severity or fire effects, and missing the short and long-term ecological story. Fire behavior depends on fuels, weather and terrain. Recognizing the boundless combinations of these factors that make up the fire environment, fire effects are unlimited over such large fires. This translates to multiple fire effects and severities experienced within the perimeter of a wildfire, and within vegetation existing across the landscape. This analysis examines several of the largest fires that burned in the Southwest during the 2011 and 2012 fire seasons. We investigate fire severity by Biophysical setting, and quantify the broad range of severities experienced over these landscapes compared to historical reference conditions. More specifically, we compare current fire severity to historic fire regime characteristics in order to assess whether fire effects are within a natural range of variability. Results indicate that while many large fires demonstrate effects outside of what would be historically expected, many acres within these fires also benefit from fire as a natural disturbance.

Waltz, Amy

AMY WALTZ – The Ecological Restoration Institute, Northern Arizona University Amy is a research ecologist with a PhD in insect and understory responses to ecological restoration in ponderosa pine. Amy worked 2005 – 2011 in a cost-share position between The Nature Conservancy and Deschutes National Forest working with agency staff to augment monitoring efforts on federal fuel reduction projects and assess landscape conditions. In that position she also coordinated The Deschutes Fire Learning Network, a group of Central Oregon stakeholders working to accelerate the restoration of fire adapted systems and increase transparency in forest management issues; through this group she co-led the successful proposal for the CFLRP-funded Deschutes Collaborative Forest Project. Her current position is the Program Director of

Science Outreach; she works with stakeholder groups and land management agencies to assess research gaps, accomplish research through the Institute and develop outreach products.

Oral presentation, Thursday, 1:40 PM, C121

A comparison of fuel treatment priority scenarios within Arizona's largest wildfire.

Uncharacteristically large and severe wildfires, or mega-fires, are occurring with increasing frequency over the last decades in the western United States. The 2011 Wallow Fire, a 538,049-acre (217,740-hectare) fire in the conifer forests of eastern Arizona, provided the opportunity to compare the effectiveness of different hypothetical treatment scenarios at reducing fire effects. To evaluate how treatment scenarios based on different values at risk influence landscape-level fire effects, we used FlamMap to model fire behavior under the following priority scenarios: 1) 2010 pre-fire conditions; 2) a Wildland-Urban Interface (WUI) priority (based on national priorities) where stands with high fire risk (Fire Program Analysis data) within WUI boundaries were "treated" to produce lower canopy cover and crown bulk density and fire models more indicative of open-canopied conifer forests; 3) a "Restoration Opportunity" priority, where forests stands in frequent-fire systems that exhibited closed canopy and high tree densities occurring across the landscape were treated as above; and 4) a scenario that represented a blend of 2 and 3. Key findings included: 1) Fuel reduction treatments were effective at reducing fire behavior and reducing risk to prioritized values like communities. 2) WUI-only treatments resulted in large, contiguous areas with unchanged crowning potential across the pre-treatment landscape. Continuous fuels in uncharacteristically high loadings continued to support active and passive crowning in 20,000 – 40,000-acre (~8,000 - ~16,000 hectare) blocks with potential losses to ecological integrity in forests adapted to more frequent fire conditions. 3) Fuel reduction treatments simulated at broader scales had bigger impacts on overall reduction of crown fire within the Wallow Fire perimeter. The continued investment of the majority of treatments in the WUI does provide protection for communities; however, our results suggest this strategy alone will not solve continuing ecological degradation from uncharacteristically severe fire on the greater landscape.

Watson, Brett

Brett Watson Student Researcher Department of Forestry & Wildland Resources, Humboldt State University (2006-2011) SAFE National Co-Chair 2008-2009

Oral presentation, Tuesday, 3:25 PM, B112

Wildfire Smoke Effects on Flora

Smoke from wildfires has been postulated to have been 4-10 times greater during the preindustrial era. Therefore, the emissions from fires have affected flora for millennia prior to the reduced smoke period of the last century. In spite of this relationship, little research has been done to quantify the effects of smoke on plant growth and stress. Here, I review the literature on composition of smoke and its correlates with other pollutants where more results are known. For example, variations and damage to stomatal structure and function (i.e. abnormalities in epicuticular wax formation, loss of stomatal control and premature needle abscission) in response to contact with gaseous pollutants such as SO_2 and $[NO]_x$, has been thoroughly investigated. We also know that submicrometer aerosols comprised of $[NO]_x$ affect substomatal structures via a stomatal pathway. In addition, I present my ongoing research which includes images collected with scanning electron microscopy of leaf surfaces after exposure to smoke generated from wildland fuels. Needs highlighted by this review are that i. little work has been done on smoke and plant growth, and ii. future work should link other pollution literature (especially on $CO, CO_2, NO_x, SO_2, CH_4$) to better estimate plant growth and responses to smoke.

Watts, Adam

Adam Watts completed his Ph.D. in Ecology in 2012 at the University of Florida, where he studied fire ecology and biogeomorphic patterning in a large wetland landscape. Among Watts's findings from his dissertation are that fire influences the structure of wetland forest patches, and that the signature of these patches can be seen in bedrock underlying the landscape where they occur.

Oral presentation, Thursday, 2:05 PM, C121

Can underlying structure in fire occurrence data predict future wildfires?

Wildland fire occurrences appear as discrete spatial and temporal events. Naturally ignited wildfires can be thought of as arising from interactions among fuel loading, fuel availability, and ignition sources, among other factors. Because these factors themselves result from both deterministic and stochastic processes, their interactions may provide some underly-

ing structure to patterns of wildland fire occurrence over long periods. However, discerning this structure in fire data sets is notoriously difficult. I examined fire occurrence data for Florida and Alaska USA during a 31-year period using phase-space reconstruction and surrogate data analysis to determine whether underlying deterministic patterns appeared in these nonlinear time-series data. Results of this analysis suggest that fires in both areas exhibit chaotic behavior, but that there is underlying deterministic structure suggesting the presence of strange attractors. This deciphering of nonlinear dynamics in fire occurrence may improve our ability to detect trends over time in wildfire patterns, including the possibility for new methods of forecasting wildfires.

Weise, David

David R. Weise, Research Forester, USDA Forest Service has been involved in prescribed fire research in the southeastern and southwestern U.S. for the past 32 years. His current research interests focus on low intensity fire behavior in live fuels such as chaparral, sagebrush, and gallberry.

Oral presentation, Wednesday, 11:25 AM, C121

Some effects of simulated crown scorch on loblolly and slash pine

Prescribed fire is used extensively in the southern United States in the management of southern pines and can result in crown damage to overstory trees resulting in growth loss and mortality. It is unknown if the causes of growth loss and mortality are due to foliage loss or damage to roots and the bole. We established a study in 1986 to isolate the effects of manual defoliation (as a surrogate for crown scorch) on loblolly and slash pine growth and mortality in order to gain a better understanding of post-fire response. We examined both the level and timing of defoliation for 5 years. Removal of foliage resulted in significant reductions of volume growth in young loblolly and slash pines. The impacts of foliage loss on growth were greatest for the October defoliation. D.b.h. losses were greater than height losses. Defoliation affected the number of height growth flushes produced. The effects were generally short-lived; we observed little difference in the number of height growth flushes in the third year following treatment. Total October defoliation resulted in high mortality for loblolly pine and moderate mortality for slash pine at one of the two slash pine study locations.

Weise, David

David Weise, Research Forester with the U.S. Forest Service, has been involved in prescribed fire research since 1980 in the southern and southwestern U.S. For the past 12 years, he has led a team and coordinated fundamental fire behavior research in shrub fuels with a focus on chaparral. This experimental and modeling work has documented shortcomings of existing fire spread models and indicated the importance of convective heat transfer for successful fire spread in these fuel types.

Oral presentation, Tuesday, 3:25 PM, C122

Simulating Fire Spread in Chamise Chaparral Fuel Beds

The ability of the Wildland-urban Interface Fire Dynamics Simulator (WFDS version 5.5.3), to simulate fire spread in fuel beds composed of living plant material < 0.63 cm diameter was evaluated using laboratory fires. Homogenous fuel beds composed of chamise (Adenostoma fasciculatum), a common chaparral plant species, were burned under various wind velocity and slope angle configurations. Fire spread successfully in 70 of 113 experimental fuel beds. Two different thermal degradation models were used in the WFDS simulations: a linear thermal degradation model with no char combustion and an Arrhenius-based thermal degradation model with char combustion. The linear degradation model only produced successful fire spread in one of the 113 simulations. Using char combustion with the linear model did not improve simulation success. Simulations using the Arrhenius-based degradation model produced successful spread in 24 of the 113 simulations. As expected, the simulated gas phase temperatures in the fuel beds were much higher when the Arrhenius-based model was used. Qualitative and quantitative comparisons of the different simulations will be presented.

Westerling, Anthony

Dr. Anthony Westerling is an Associate Professor of Environmental Engineering and Geography at UC Merced. Prior to coming to UC Merced in 2006, he spent six years in the Climate Research Division of Scripps Institution of Oceanography as a Post-graduate Researcher and an Assistant Project Scientist. His research interests include applied climatology and seasonal forecasting for wildfire management, climate change impacts on wildfire and related aspects of mountain hydrology, and paleo reconstructions of climate-wildfire interactions. Dr. Westerling holds a B.A. from the University of Califor-

nia, Los Angeles; and a Ph.D. from the University of California, San Diego. He has published extensively on wildfire and climate in the western United States.

Oral presentation, Tuesday, 11:00 AM, C122

Incorporating lightning scenarios into seasonal fire forecasts over California and Nevada.

We present an update and extension of statistical forecast systems for California and Nevada. These statistical models use observed hydroclimate, land surface characteristics, and lightning detections to model the probability of large fire occurrence at monthly to seasonal lead times. Historical archives of lightning detections are used to generate a range of natural ignition scenarios that, combined with antecedent climate observations, robustly characterize monthly wildfire risks on a 1/8 degree grid. Forecasts through the May - October fire season are updated monthly. We present maps of fire occurrence odds ratios, probabilities and simulated fires that demonstrate the effects of various lead times on forecast strength and how interactions between antecedent climate and concurrent lightning strikes shape fire risks in a fire-prone environment.

White, Eric

Eric M. White is Assistant Professor in the College of Forestry at Oregon State University. His research relates to natural resource economics and policy. He is a co-recipient of a U.S. Department of Agriculture Honor Award for Excellence for research to protect and enhance open space and natural resources.

Oral presentation, Wednesday, 4:40 PM, B113

Fuels management behavior of NIPF landowners in a fire-prone system

Non-industrial private forestland (NIPF) is an important component of the eastern Oregon forested landscape and is frequently located within a matrix of public forest, residential development, and industrial timberland. The resource conditions and management of NIPF parcels influence the service flows provided from natural resources across the entire landscape as well as the potential magnitude of any resource and property damage resulting from natural disturbances such as fire. Identifying and measuring the factors influencing NIPF owners' adoption of fuel treatment activities to reduce fire risk can improve understanding of the outcomes of policies and events in complex fire-prone landscapes. Within this context, we surveyed NIPF owners located in four counties of fire-prone central and southern Oregon. We characterize NIPF owners' perceptions of wildfire likelihood, fuel treatment efficacy, and forest health as well as the perceived role of their own and neighboring parcels in contributing to wildfire events. We measure NIPF owners' propensity to complete fuel treatments and the potential contribution of influencing factors, such as previous wildfire exposure, landowner characteristics, existing fuel conditions, management activities and conditions on neighboring parcels, and social networks on those decisions. Results are reported within the context of incorporating the fire and fuels management behavior of forest landowners in an agent-based model describing coupled human and natural systems in the study region.

Wilder, Spus

Spus Wilder grew up on his family's small ranch outside of Nespelem, WA on the Colville Indian Reservation, where he is an enrolled member. He's the youngest of six siblings and uncle to eleven nephews and nieces. After earning his diploma from Lake Roosevelt HS, Spus attended Salish Kootenai College. In 2010, Spus completed BS degrees in Forestry and Environmental Science from Salish Kootenai College. Currently, he is working on a Master of Science degree in Forest Resources from the University of WA.   Spus informally began his natural resource/agricultural career as a 4-H member and ranchhand on his family's farm. Since 2003, Spus has worked summer jobs and internships for several agencies, in various disciplines of natural resource management. Spus is currently   employed as a Graduate Student Research Assistant in the School of Environmental and Forest Sciences at the UW.

Oral presentation, Wednesday, 3:25 PM, C126

Quantifying forest patterns within the Yakama Nation Tribal Forest and Okanogan-Wenatchee National Forest

In excess of the past century, North America has experienced drastic anthropogenic land use change. This change has come from many practices such as agriculture, fire suppression, urbanization, mining, etc. These changes have complex social, economic, and environmental interactions and consequences. The objectives of this research project are to identify similar sub-watersheds in the Yakama Tribal Forest and Naches Ranger District, collect data using U.S.F.S. photo interpretation protocols, conduct geospatial and multivariate statistical analyses, and interpret forest patterns in correlation to statistical results. This will help quantify and specify forestry policies and implementation activities, from the respective management regimes, that are affecting forest patterns. The end goal of the research project is to assess specific manage-

ment practices from both regimes and highlight beneficial activities and outcomes to help optimize forest health restoration activities throughout the study area.

Wildland Fire Management RD&A staff,

Wildland Fire Management RD&A coordinate fire science application, maintain the Wildland Fire Decision Support System (WFDSS), project fire season costs, coordinate scientific efforts associated with wildland fire costs, and participate in developing hazardous fuels planning applications.

Oral presentation, Thursday, 2:30 PM, B110

Collaborative approaches: Ten years of advancement in research collaboration and decision support systems

Recommendation 5 submitted to the Joint Fire Science Program Governing Board a decade ago stated that "Collaborative approaches to research, development, and implementation of new information and decision support tools need to be encouraged". A number of advances have been made over the past decade. The Wildland Fire Management RD&A group now coordinates fire science applications, provide decision support, project fire season costs, and participate in the National Fire Decision Support Center. The Wildland Fire Situation Analysis (WFSA) has been replaced by the more flexible, scalable web based Wildland Fire Decision Support System (WFDSS). The new WFDSS system utilizes modern technology and enables spatial data layering, convenient map displays, is scalable for single or multiple fire situations, and provides convenient pre-loaded information from multiple sources. The Joint Fire Science Program (JFSP) provides access fire science information, resources and funding announcements for scientists, fire practitioners and decision makers and FRAMES offers a searchable resource catalog for fire managers and scientists. The Fire Consortia for Advanced Modeling of Meteorology and Smoke (FCAMMS) provide more accurate weather information at a time-scale useful for real time fire management using internet communication technology. Future goals include a National Cohesive Wildland Fire Management Strategy that seeks seamless fire management across jurisdictions.

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 which catalyze native biodiversity and ecosystem health. She tested nature's resilience to fire in restoration and wrote Mimicking Fire to Improve Chaparral Restoration (Submitted to Madrono, 2011). During this time she completed small-scale prescribed fires and became acutely aware of California fire management difficulties. The stark contrast between fire programs in Florida and California was partially founded in cultural differences. This difference caused Kate to expand her ecosystem science interests and engage in the social science discussion as a PhD student in the Department of Environmental Science, Policy, and Management at University of California, Berkeley.

Oral presentation, Wednesday, 2:30 PM, C126

Social relationships and their resulting property types fuel wildland fire outcomes

Every year, California's Wildland Urban Interface and Intermix (WUI) burns. During the last three decades, wildfires in the United States have cost hundreds of millions of dollars, destroyed tens of thousands of homes, required millions to be evacuated, and killed more than one hundred people However, like many natural disturbances, fire risk can be mitigated. Experiments, theoretical models, and real-life outcomes support growing consensus in the scientific community about the relative importance of risk mitigation strategies. Yet it remains unclear how to implement these findings. In order to achieve the best wildland fire outcomes, we emphasize social relationships as an important fire-risk mitigation strategy. We synthesize wildland fire-risk mitigation literature and outline the best mitigation strategies. These strategies incorporate social relationships and their resulting property types which make pre-existing WUI neighborhoods safer. To achieve the best wildland fire outcomes, social relationships must be added to the discussion around fire risk mitigation.

Wohlgemuth, Peter

Pete Wohlgemuth is a Hydrologist for the USDA Forest Service, Pacific Southwest Research Station located at the Forest Fire Laboratory in Riverside, California. He has spent three decades documenting and quantifying post-fire erosion and sedimentation as well as evaluating the effectiveness and consequences of post-fire erosion control measures.

Oral presentation, Thursday, 11:00 AM, C120

The Effectiveness of Mulches for Post-fire Erosion Control in Southern California Chaparral

High severity wildfire can make landscapes susceptible to accelerated erosion that may retard resource recovery. Land managers often use mitigation measures on the burned hillside slopes to control sediment fluxes as the first step in post-fire restoration. Agricultural straw has long been used for post-fire erosion control, but recently a number of new mulch products have been developed that have not been rigorously field-tested in wildland settings: aerial hydromulch, a slurry of paper or wood fiber with tackifiers that dries to a permeable crust; wood shreds, small irregular chunks of wood manufactured in a tub grinder; and wood straw, wood strips similar in size and shape to agricultural straw but denser and less susceptible to wind removal. Concerns have been raised over the ability of these mulches to reduce hillslope erosion as well as for potential for negative effects on post-fire ecosystem recovery. Since 2007 we have measured sediment fluxes on plots treated operationally with these mulches and compared them to untreated controls after three separate wildfires in southern California. These study plots, located on steep slopes with coarse upland soils previously covered with dense mixed chaparral vegetation, were monitored with silt fences to trap eroded sediment. Although dependent on rainfall and site characteristics, surface erosion on untreated plots generally attenuated sharply with years since burning. We found that all mulches reduced bare ground on the treated plots and that this cover persisted through the first post-fire winter rainy season. For the initial year after a fire, mulches reduced hillslope erosion from small and medium rainstorms, but not during an extremely high intensity rainfall event. All treatments reduced hillslope erosion, but the hydromulch had better first-year performance, while the wood products afforded more lasting protection. Thus, in chaparral ecosystems mulches appear to be an effective post-fire erosion control measure.

Woolley, Travis

Currently a Faculty Research Assistant working on forest health and fire ecology. Recent projects include mountain pine beetle effects on forest structure and fire behavior and post-fire tree mortality modeling. Research interests include disturbance interactions, climate change influences on forests, and restoration ecology. B.S. in Natural resources and Forest ecosystems from Oregon State University, and an M.S in Forest Science from Oregon State University.

Oral presentation, Tuesday, 1:15 PM, B115

Looking beyond red crowns: Canopy and surface fuels in lodgepole pine forests following mountain pine beetle epidemics in south-central Oregon

Mountain pine beetle (Dendroctonus ponderosae:MPB), a bark beetle native to the western U.S., has caused extensive lodgepole pine mortality in south-central Oregon, peaking at over 1,000,000 acres of mortality in 1986 and over 500,000 cumulative acres in the past decade (USFS-FHP Aerial Detection Survey data). This widespread mortality has raised concerns over the potential for extreme fire behavior across large landscapes as forest structure is altered following these MPB epidemics. However, previous research has provided equivocal evidence concerning temporal and spatial changes of post-MPB fuels. In addition, lodgepole pine forests in south-central Oregon are ecologically unique (e.g., low cone serotiny, primarily climax lodgepole pine communities) compared to the remaining extent of the species' range. Using a chronosequence approach, we sampled fuels and forest structure in 215 plots to understand how fuel profiles (ground, surface, ladder and crown fuels) in these lodgepole pine forests change over time in response to MPB epidemics. Using multivariate cluster analysis we delineated post-MPB environments based on fuel complexes. Using this technique we are able to elucidate and quantify changes in fuels over time for managers, rather than illustrating changes in fuels over time using ad-hoc/arbitrary groupings of fuel complexes. Previous research has focused primarily on the beginning phases of MPB epidemics (the red phase) and less attention has been given to the decades following MPB epidemics when fuels and forest structure can change dramatically. The changes in fuels associations over a 30 year time frame, comparisons to the standard fire behavior fuel models and use in fire behavior modeling will be described.

Wright, Vita

A social science analyst specializing in fire science application, Vita Wright works in a shared position between the Rocky Mountain Research Station (RMRS) Human Factors & Risk Management RD&A and the NPS Branch of Wildland Fire. Her research focuses on individual and organizational influences to the success of fire science delivery. Vita currently serves as Principal Investigator for the Northern Rockies Fire Science Network. Prior to that, she developed and led the Aldo Leopold Wilderness Research Institute's Research Application Program. Both efforts aim to improve the communication of scientific information between scientists and managers by increasing accessibility to scientific tools and knowledge.

Oral presentation, Wednesday, 1:40 PM, B117

Influences to the Adoption of Science for Fire Management

Fifty years of scientific literature on human behavior, communication, and organizations offer numerous insights into the communication and use of science in the context of public land management. Using diverse but complementary social science theories and methods, I studied individual and organizational influences to the adoption of science by federal fire managers and decision makers. Individual 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. Applying Diffusion of Innovation theory, percentages of early and late adopters were different in different fire management positions; for example, fire ecologists showed the greatest percentage of early adopters. These results are consistent with two other recent surveys of federal fire managers that showed fire ecologists to have higher education levels and greater interaction with scientists than other fire managers. Study results also supported the Technology Acceptance Model by showing individual beliefs about research usefulness to be better predictors of use than beliefs about ease of use. Organizationally, perceptions of learning culture and process varied by pay grade level; those at higher levels showed more positive views than those at lower levels. The following characteristics of learning organizations showed the most room for improvement in the fire management community: time for reflection, appreciation of differences and analysis of assumptions. Finally, structural equation modeling was used to compare the relative influence of individual beliefs and attitudes versus organizational culture on research use. Based on study results, I conclude with recommendations to scientists, science communicators, and upper level land managers interested in bridging the gap between science and decision making by public fire managers.

Wright, Vita

(See biographical information, above.)

Oral presentation, Tuesday, 2:05 PM, B111

Understanding Science Communication among Fire Professionals

Recent science communication studies of the federal fire management community suggest managers access research via informal information networks, and that these networks vary by both agency and position. We used a phone survey to understand the informal science communication networks of fire professionals in two of the Joint Fire Science Program's regional knowledge exchange consortia: the Northern Rockies Fire Science Network and the Southwest Fire Science Consortium. In these two regions of the western United States, we sampled federal and tribal decision makers, fire management officers, fire ecologists, and fuels specialists to determine: 1) who they go to for scientific information about fuels or fire effects science, 2) why they go to these individuals, and 3) how they communicate with these individuals. Informal science communication networks varied by both professional position and information type (fuels vs. fire effects), with fuels specialists being universally important informants about science. For fire effects information, natural resource specialists, fire ecologists, and researchers were also important. Overall, fire and fuels managers tended to communicate within their own agencies but across work units. However, fire ecologists tended to go outside their agency and communicate with researchers more than other positions. Of five reasons for contacting informants (position, personal history, topical expertise, local knowledge, accessibility), professional position was the most important. Fire science communicators can use such information about informal fire science communication networks to design points of entry for more strategic and efficient dissemination of innovations in fire and fuels science. In contrast to a broadcast approach to science communication, a more strategic approach based on understanding the characteristics of fire science communication networks is expected to shorten time lags to diffusion.

Wright, Vita

(See biographical information, above.)

Oral presentation, Tuesday, 4:15 PM, B111

Fostering proactive knowledge exchange through workshops and fieldtrips

In addition to communicating fire science through passive delivery mechanisms (e.g, websites), the consortia are actively fostering cross-cultural dialog and problem-solving by organizing workshops and fieldtrips. We use varied examples from four consortia to illustrate the impact of workshops for knowledge exchange. The Alaska consortium's virtual fire modeling workshop used video conferencing technology and subject matter experts to enable dispersed participants to share and learn from others' experiences. Additionally, an in-person, live fuel moisture sampling workshop incorporated a field component that was essential for learning and strengthening scientist-practitioner relationships. Both workshops created an interactive learning environment for a small group of active and engaged users in Alaska. The California consortium's

workshop shared smoke management policies and best practices across diverse stakeholder groups. The workshop included presentations, discussion panels, and small-group breakout discussions. Engaging air quality regulators, who play a key role in the region's fire management, enhanced mutual learning and improved collaboration opportunities between fire managers and regulators. The Northern Rockies consortium's cross-cultural workshop explored challenges and solutions to incorporating traditional and scientific ecological knowledge into fire management. The workshop's fieldtrip fostered interaction among tribal and agency managers, scientists, and students. Subsequent workgroups were used to clarify challenges and propose solutions. The Southwest consortium's workshops have incorporated roundtables and breakout sessions. Interagency and interdisciplinary participation were critical for clarifying cross-disciplinary issues related to fire and fuels management. Like Alaska, they experimented with hybrid formats of in-person and webinar presentations. Workshop and fieldtrips have resulted in changes in on-the-ground implementation. These examples illustrate the importance of proactively disseminating science through direct interaction. Fieldtrips, breakout groups, and roundtables were especially successful. Virtual learning opportunities don't replace in-person interaction; however, they are a valuable way to bring together dispersed communities, especially when participants know each other or have a history of working together.

Wyatt, Katherine

Katherine H. Wyatt is a graduate student at the School of Environmental and Forest Sciences at the University of Washington. She graduated summa cum laude from Lewis and Clark College in Portland, Oregon with a BA in environmental studies and conservation biology. Katherine's passion for forest and fire ecology has been inspired by academic studies in northwest Montana and professional experiences throughout the northwest. She has worked as a collaborative facilitator in the Skagit Valley with the Nature Conservancy, as a Transfer of Development Rights Intern with the Cascade Land Conservancy, and as a Stewardship Assistant with the Jackson Hole Land Trust. Following graduation in spring 2013, Katherine looks forward to working with nonprofits, government agencies, and private stakeholders to implement science-based management and restoration.

Oral presentation, Tuesday, 1:40 PM, C126

Landscape Change Over Time: Using Aerial Photography to Understand Riparian Corridors in Fire-Dependent Ecosystems of Eastern Washington

Riparian corridors are critical components of the landscape; they contribute disproportionately to diversity, connect terrestrial to aquatic habitats, and act as corridors for migration and dispersal. In the fire-dependent landscapes of eastern Washington the role of fire and other disturbances in maintaining riparian composition and structure are poorly understood. While recent dendrochronology studies from east of the Cascades find that fire historically occurred at a similar frequency in riparian and upland sites (Everett et al. 2003, Messier et al. 2011), the effect of fire suppression on riparian corridors is unknown. This study sought to determine how riparian composition and density has changed from mid-19th century to present. To meet these objectives, I compared riparian corridors in digitized aerial photos from 1949, 1991 and 2009 for 6th level HUC. Using GIS, I explored changes in density and species composition within riparian corridors. Though not completed due to regulatory constraints, local managers from the Naches Ranger District of Eastern Washington had planned a prescribed fire for summer of 2012 to restore forest health in dry ecosystems. My original thesis work intended to compare vegetation before and after the fire. As a result of local interest in re-introducing fire and my own vested interest in the area, I focused my analysis on the Rattlesnake watershed in the Naches Ranger District. I used my previously collected intensive riparian vegetation surveys to ground-truth the 2009 aerial photos. Preliminary results comparing current to historical riparian corridors will be presented. Understanding the role of fire in the riparian corridors of fire-dependent ecosystems will be crucial for managers striving to restore these vital areas.

Yocom, Larissa

Larissa L. Yocom Post-doctoral researcher Northern Arizona University

Oral presentation, Tuesday, 3:50 PM, B113

Climate and land-use drivers of historical fires in northern Mexico

In the United States, regional-scale analyses of climate-fire relationships have been completed for several regions, as well as at the scale of western North America. Most of these studies analyzed climate-fire relationships before the 20th century, because in much of the United States fire regimes were interrupted in the mid- to late-nineteenth century by human influence. To overcome some of the anthropogenic influence of the twentieth century and extend understanding of the historical relationships between climate and fire in North America, we can look to northern Mexico. Using a network of

52 sites in 5 regions in the Sierra San Pedro Martir, the Sierra Madre Occidental, and the Sierra Madre Oriental, we compared across-region and within-region fire synchrony with climate oscillations including ENSO, PDO, and AMO, as well as combinations of these oscillations. Across-region fires in northern Mexico were more likely to occur during cool phases of ENSO (La Niña) and PDO. AMO was not significantly associated with fire occurrence. Within regions, La Niña phases of ENSO were significantly associated with fire occurrence in four of the five regions, and in three regions fires were also significantly associated with previous-year El Niño conditions. We also compared dates of fire regime disruption across northern Mexico. Dates of fire regime disruption were highly variable. This suggests that human land use change is the strong driver of fire regime interruption, overriding the influence of climate and causing widespread cessation of fire across the region in the nineteenth and twentieth centuries.

Yospin, Gabriel

Gabriel Yospin is a post-doctoral research fellow at Montana State University. His work there is part of the WildFIRE PIRE research group, which seeks to identify historic and current drivers of wildland fire behavior. His field work has included identifying plant community composition, tree growth rates and fuel loads. He also has experience working with a wide variety of vegetation models. These include dynamic global vegetation models, fire behavior models, and a new model that he developed to work directly with an agent-based model of land-use changes.

Oral presentation, Tuesday, 3:25 PM, B110

Simulations and Multi-Proxy Inferences of Historic Vegetation and Fire Dynamics: Preliminary Results from FireBGCv2 in Tasmania, Australia

Recent changes in fire regimes globally raise three major research questions about the influences of climate change and human land use and management: (1) What have been the relative and interactive influences of humans and climate on historic fire regimes? (2) How has recent climate change altered fire regimes? (3) Can knowledge of historical controls over fire regimes inform and improve fire management? Crucial to answering these questions are comparisons among study sites that exist across gradients climate and human land use. Utilizing the best fire science in land use and management decision-making requires unifying different historical records of fire activity, contemporary observations, and future projections under a wide variety of climate and land-use scenarios. Research is now underway to do so for the western United States and Cradle Mountain National Park (CMNP), Tasmania, Australia. In these locations, we employ three different types of evidence. Sedimentary pollen and charcoal records allow us to reconstruct millennial-scale fire and vegetation history at a coarse temporal grain. Tree-ring records allow us to reconstruct fire and vegetation history at a finer temporal grain. FireBGCv2 simulations then allow us to project fire and vegetation dynamics under a variety of future scenarios. The two bodies of historical evidence allow us to independently parameterize and validate FireBGCv2. Recent fieldwork at CMNP allows us to apply FireBGCv2 to a unique study site that has had a greater human influence on fire regimes. Preliminary results indicate that parameterizing the dominant tree species – which are new to this modeling system – is a key challenge. An experimental design of five climate scenarios fully crossed with five management scenarios will allow us to address our three major research questions consistently across gradients of historic climate and human land use in several FireBGCv2 study sites.

Young, Michael

Michael K. Young Research Fisheries Biologist, USDA Forest Service, Rocky Mountain Research Station I have been investigating the responses of native and nonnative stream fishes to fire for over 20 years. In 2003, I helped organize a special issue of Forest Ecology and Management on the subject of fire and fish in the western U.S.

Oral presentation, Thursday, 3:25 PM, B115

Much ado about relatively little? The resilience of trout populations to fire

Large, severe wildfires occasionally lead to the immediate decline or extirpation of trout, salmon, and charr in small streams in the western U.S. A longer-term concern is that water temperatures in post-fire environments will increase substantially and contribute to chronic reductions in fish abundance and to elimination of particularly temperature-sensitive species, such as federally listed bull trout. This concern is heightened in light of predictions that climate change will further alter temperatures directly by atmospheric warming and indirectly by increasing the prevalence of large, severe fires. We used data collected from burned and unburned watersheds before and after fires in the Bitterroot National Forest in western Montana to assess the immediate post-fire responses of stream fishes. We also used a longer-term, broad-scale data set to evaluate changes in the distribution of bull trout in the context of environmental variables including fire, nonnative

species, and local climate. In many streams, abundance of native and non-native trout species declined following fire, but rarely to the point of extirpation. In subsequent years, populations of native fish rebounded immediately, often exceeding pre-fire abundances. Based on the long-term observations, fire appeared to have little effect on presence or absence of bull trout. In contrast, climate warming and nonnative species were linked to declines in bull trout presence. These results, and those from elsewhere in the literature, indicate that native trout and charr may be well adapted to environmental change associated with fire. In contrast, these fishes may be intolerant of invading species and the thermal and hydrologic shifts associated with climate change.

Ziegler, Justin

Justin Ziegler is currently a Masters of Science student in the Department of Forest and Rangeland Stewardship at Colorado State University and an officer in the CSU chapter of the Student Association for Fire Ecology. He received a Bachelors of Science from the University of Idaho in both Forest Resources and Fire Ecology and Management in 2011. His current research includes the influence of spatial complexity on potential fire behavior.

Oral presentation, Tuesday, 11:25 AM, B117

Evaluating fuel treatment effects on structure and spatial pattern in fire-frequent forests of Colorado

Forest managers are increasingly incorporating spatial objectives into fuel treatments across fire-frequent forest types in an attempt to restore historic structure and ecosystem function. Investigation of historical spatial pattern and structure has shown that fire-frequent forests were characterized as a mixture of isolated single-trees, various sized clumps of trees, and non-forested gaps. However, implementation and evaluation of treatment prescriptions with spatially-explicit goals of recreating such a mixture is challenging due to a legacy of timber-oriented management, difficulty in interpreting spatial statistics, and non-spatial planning tools. Our goal in this study was to quantify the effect of fuel treatments on forest structure, tree spatial patterns and stand complexity across a gradient of forest types ranging from pure ponderosa pine to dry mixed-conifer in Colorado. To quantify these changes, we collected crown measurements and stem-mapped all cut and remaining trees on four 4-ha plots. We evaluated changes in both the global and local point patterns using a combination of first- and second-order spatial statistics. To evaluate changes in stand complexity we analyzed our data using the stand complexity index. Here we present the results of global and local spatial point pattern comparisons and stand complexity index comparisons between pre- and post-restoration treatment forests. Additionally we evaluate post-treatment point patterns against reconstructed historical patterns reported in the literature and discuss future work investigating the role of spatial complexity and heterogeneity on potential fire behavior.

Zybach, Bob

Bob Zybach is a forester and forest scientist with a long career in the woods of the Pacific Northwest. From the mid-1960s until the late 1980s he was in the reforestation industry, including 20 years as owner of a successful reforestation business. He has a PhD in Environmental Sciences from Oregon State University, with the focus of his research in reforestation, wildfire, and Indian burning history of western US forests. He has been Program Manager for Oregon Websites and Watersheds Project, Inc. (www.ORWW.org) since it was formed. ORWW is a nonprofit internet-based educational organization that maintains a YouTube video channel (www.youtube.com/ORWWmedia) and has had more than 2 million combined student and teacher visitors since its launch in January, 1997.

Oral presentation, Wednesday, 11:00 AM, B114

The Great Fires: Indian Burning and Catastrophic Forest Fire Patterns of the Oregon Coast Range, 1491-1951

This study examined the relationship between land management practices of Indian communities prior to contact with Europeans and the nature of subsequent catastrophic-scale forest fires in the Oregon Coast Range. Research focused on spatial and temporal patterns of Indian burning across the landscape from 1491 until 1843, and corresponding patterns of catastrophic fire events from 1844 until 1951. Archival and anthropological research methods were used to obtain early surveys, maps, drawings, photographs, interviews, Geographic Information Systems (GIS) inventories, eyewitness accounts and other sources of evidence that document fire history. Data were tabulated, mapped, and digitized as new GIS layers for purposes of comparative analysis. An abundance of useful historical evidence was found for reconstructing precontact vegetation patterns and human burning practices in western Oregon. The data also proved useful for documenting local and regional forest fire histories. Precontact Indians used fire to produce landscape patterns of trails, patches, fields, woodlands, forests and grasslands that varied from time to time and place to place, partly due to demographic, cultural, topographic, and climatic differences that existed throughout the Coast Range. Native plants were systematically managed

by local Indian families in even-aged stands -- usually dominated by a single species -- throughout all river basins of the study area. Oak, hazel, camas, wapato, tarweed, iris, strawberries, huckleberries, bracken fern, nettles, tobacco, and other plants were raised in select areas by all known tribes, over long periods of time. This study demonstrates a high rate of co-incidence between the land management practices of precontact Indian communities, and the causes, timing, boundaries, severity, and extent of subsequent catastrophic forest fires in the same areas – indicating that many current scientific and policy assumptions regarding the abundance and extent of precontact western Oregon old-growth forests may have been erroneous.

Zybach, Bob

(See biographical information, above.)

Oral presentation, Wednesday, 3:25 PM, B114

Successful Predictions of Oregon's 2012 Catastrophic Wildfire Events: Methods and Results

Large-scale wildfires – particularly those of catastrophic proportions – are nearly impossible to predict. The reasons for this difficulty are contained in the classic fire triangle: although topography is a relatively stable condition, fuel, weather, and ignitions provide limitless combinations of possibilities across the landscape, making highly specific predictions impossible. Despite these problems, the combinations of historical data and modern technology have conspired to make such projections increasingly accurate through time: particularly since the advent of computerized wildfire predictive models and GIS datasets during the past 20 years. Recent improvements in such methods provided motivation to attempt to predict, in advance, the timing (in months) and location (by drainage) of any catastrophic-scale wildfires (defined as 100,000 acres or larger) that might occur in Oregon during 2012. More generally, a related attempt was made to determine when and where any wildfires were most likely to occur during the same timeframe, as such extensive fires are unusual in Oregon and do not take place most years. Historical data and three predictive maps from independent sources were used to address these questions in early June 2012. By July 4, an article documenting these predictions had been printed in a popular magazine and was being distributed statewide. On July 9, the first of at least five catastrophic-scale wildfires to take place in Oregon this year was reported – exactly when and where predicted. The subsequent four fires of similar magnitude have also matched predicted times and places. As this is being written (September 1), the 2012 Oregon fire season is still in progress: measured in acres, it is the largest in history. Currently, the Long Draw (558,000 acres), Holloway (461,000 acres), Miller Homestead (161,000 acres), Barry Point (93,000 acres), and Cache Creek (73,000 acres) wildfires are still active and could become much larger with changed weather conditions.

ABSTRACTS AND PRESENTER BIOGRAPHICAL INFORMATION
POSTER PRESENTATIONS

Abstracts for poster presentations and biographical information for presenters are listed alphabetically below by presenting author's last name. Abstracts and biographical information appear unmodified, as submitted by the corresponding authors. A poster identification number is provided next to the presenter's name.

Adam, Ezza   (Poster #5)

Ezza Adam, Miss, Researcher. leader of conservation of medicinal and aromatic plants project.

Effect of natural fire on germination and seed storage behavior of Blepharis linariifolia

This study was conducted in Blepharis linariifolia seeds collected from areas subjected to fire to study the short and long term effect of fire on germination. Results from this study showed that response of B.linariifolia seeds to the effect of fire varies in the different stages of maturity, and under different storage conditions and storage duration. However both of mature and pre-mature seeds of B.linariifolia showed secondary dormancy after fire, pre mature seeds storage behavior (dormancy\germintion rhythm) seemed to be more affected by fire than mature seeds, and also seeds under cold storage conditions are most affected. No germination was recorded at zero time of storage, then germination was monitue for duration of 18th months..

Ager, Alan   (Poster #76)

Alan Ager is an Operations Research Analyst at the Western Wildland Environmental Threat Assessment Center. His interests include wildfire simulation modeling, landscape planning, and the application of risk cience applications to fuel management planning

Analyzing the transmission of wildfire risk on fragmented landscapes

Large wildfires in the US and elsewhere burn over long distances and typically cross many ecological and anthropomorphic boundaries. When conditions in one parcel strongly affect wildfire risk factors (likelihood, intensity) in an adjacent parcel, risk is potentially transmitted from one to the other. Current wildfire simulation methods limit the practicality of estimating transmitted E(L) primarily because processing pixel-specific intensity maps for a large number of fires would be overwhelming. Estimating transmitted P is, however, possible using recent modeling enhancements that allow efficient calculation and storage of simulated wildfire perimeters. In this paper we describe initial work to quantify the transmission of wildfire risk, focusing on the exposure (likelihood and intensity) component of risk. We studied transmission on and around a typical national forest that was divided into numerous land designations as part forest planning efforts. We used simulation modeling to examine the transmission of wildfire exposure among the land designations, and the effect of fuel treatments to reduce it. We built transmission network diagrams with social networking software (CASOS) and used graph theory to characterize land designations in terms of their network properties. The results of the study will be discussed in the context of fuel management planning and conservation planning.

Agne, Michelle   (Poster #26)

Michelle Agne, Graduate Student, Oregon State University I am a second year master's student studying forest disturbance ecology at the College of Forestry at Oregon State University with Dave Shaw. I am a Rick Strachan Fellow and a graduate representative to my department. I have spent the last three summers working in the mountain pine beetle disturbed lodgepole pine forests of Central Oregon.

The effect of mountain pine beetle and dwarf mistletoe on canopy structure and fire behavior in Oregon lodgepole pine forests

Mountain pine beetle (Dendroctonous ponderosae), lodgepole pine dwarf mistletoe (Arceuthobium americanum), and fire are three important agents of disturbance in lodgepole pine forests in Central Oregon. Both mountain pine beetle and dwarf mistletoe have impacts on stand structure that may have significant importance to fire potential, and specifically may impact the likelihood of an active crown fire. Although recent mountain pine beetle epidemics in British Columbia and the Rocky Mountains have incited research regarding changes in fire behavior post-epidemic, studies accounting for the structural impacts of dwarf mistletoe have not been conducted. Because both mountain pine beetle and dwarf mistletoe are widely distributed and often occur simultaneously in lodgepole pine forests, their combined impacts on canopy struc-

ture must be investigated to create more accurate fuel models to inform fire behavior models for use in these areas.   The broad aim of the proposed research is to gain a better understanding of the predictive power of fire behavior models in disturbed lodgepole pine. This goal will be met by two objectives: (1) Understanding differences in canopy structure between lodgepole pine stands influenced by dwarf mistletoe and mountain pine beetle and those that are not, and (2) predicting fire behavior in these stands using information about canopy structure. To meet these objectives I hypothesize that (i) stands severely infected with dwarf mistletoe have a significantly lower canopy base height than uninfected stands and (ii) the difference in canopy base height significantly increases the likelihood of crown fire in infected areas as predicted by a fire behavior model when compared with uninfected areas. Measurements taken will lead to more accurate prediction of fire behavior in areas disturbed by mountain pine beetle and dwarf mistletoe. Improvement of these models is needed to determine areas of high fire risk and potential areas for fuels treatments.

Alvarado-Celestino, Ernesto   (Poster #65)

Ernesto Alvarado Celestino studied forestry in Mexico, and then obtained a Ph. D. from University of Washigton, where he is now part of the faculty.

Physical Properties of Downed Woody Debris in Mexican Ecosystems

Down Woody Debris include all branches and trunks that fall into the ground, constitute an important component of forest floor fuels, and together with litter duff constitute the combustion environment. In 2004, The Mexican Forestry Commission launched a new protocol for the National Forest Inventory (NFI), which is intended to record information on all different terrestrial ecosystems in Mexico through the repeated measurement of vegetation plots every five years. As part of such inventories, data on Downed Woody Debris are being measured in a subset of those plots, to document fuel loads and to use that information towards a more adequate planning of countrywide fire management strategies. However, Van Wagner's basic equation to estimate DWD loads from line census data, requires information on physical properties, particularly on mean diameters of particles and specific gravity of fuels. Here we report a literature analysis of data available on physical properties for fuels in Mexican ecosystems. Our objectives were to provide adequate estimates of physical properties for those ecosystems where enough information existed, and to identify forest ecosystems where this information is scarce, and hence more research is needed. We classified the major forest ecosystems found in Mexico into six major classes, which in turn were divided into 17 forest type categories. We found 65 references with useful information. Most information was available on wood specific density for 1000 hr particles. Pine forests had by far the most information, but even fire prone ecosystems such as broad leaved temperate forests had few quantitative reports. Most information on seasonally dry and wet tropical forests came from reports of tree species densities. Clearly, descriptive research on physical properties of DWD in most Mexican ecosystems is needed for the NFI fuel information to serve its intended purpose.

Andrews, Garren   (Poster #46)

Garren M. Andrews   California Polytechnic State University, San Luis Obispo Graduate Research Assistant Master of Science in Forestry Sciences candidate

Developing post-fire mortality predictive models for the major overstory tree species in the Santa Cruz Mountains of California

We investigated how fire severity impacts the mortality of multiple species in the Santa Cruz Mountains of coastal California, including coast redwood (Sequoia sempervirens), Douglas-fir (Pseudotsuga menziesii), and tanoak (Lithocarpus densiflorus. During August 2009 the Lockheed fire burned nearly 3,160ha of mixed-conifer stands with variable severity. Data from 37 Continuous Forest Inventory (CFI) plots were collected immediately before and for the following 2 successive years following the 2009 Lockheed Fire.   This research quantified post-fire mortality of trees that vary in species, size, and fire severity. We developed logistic regression models that predict post-fire mortality from a combination of fire severity and tree physiological measures for Coast redwood, Douglas-fir and tanoak. Understanding the relationship between burn severity and mortality can allow for better post-fire predictive services and management. This research can support forest managers in determining the best management practices to facilitate long-term sustainability and protection of environmental infrastructure within Coast redwood/Douglas-fir forests.

Arsenault, André   (Poster #43)

André Arsenault, Forest Ecologist, Canadian Forest Service

Response of the understory plant community to prescribed fire, screefing, grazing and logging in dry interior Douglas-fir forests of southern British Columbia.

Dry forests of British Columbia's southern interior are considered ecosystems of conservation concern due to a long history of habitat loss and the presence of species at the northern extent of their range. A wide variety of management systems have been used to direct vegetation succession for range and timber objectives over the last century. More recently other management systems also aimed at directing succession in these forests have emerged i.e. ecosystem restoration and fuel reduction treatments. Surprisingly, very few experiments have been done to evaluate the success, trade-offs, and costs of such treatments. The Isobel project near Kamloops, British Columbia, was initiated in 2001 to develop and assess prescriptions to maintain prolonged open canopy conditions in dry Douglas-fir forests. The experiment involves three levels of harvesting removal (0% (control), 50–60% and 75–80%), three site preparation treatments site preparation treatments (no site preparation, mechanical spot screefing, prescribed fire) nested in and out of livestock exclosures. Vegetation response was monitored at 2160 1 m2 vegetation plots distributed in the 72 treatment units. Species composition generally fell into three main groups following harvest: increasers such as pinegrass (Calamagrostis rubescens); decreasers such as rattle-snake plantain (Goodyera oblongifolia); and species such as common snowberry (Symphoricarpos albus) whose response appears to be more closely associated with site factors such as soil moisture than understory light. Few species were only associated with prescribed burns which suggest that the plant community is well adapted to a variety of disturbance agents and is not "fire dependent". The severity and number of disturbance types which overlap are key in predicting vegetation response. These results will assist in developing tools for directing succession in dry forests to achieve a variety of objectives in sustainable and cost-effective manner.

Assal, Timothy   (Poster #12)

Timothy J. Assal U.S. Geological Survey and Colorado State University   Tim is a graduate student in the Graduate Degree Program in Ecology at Colorado State University and an ecologist with United States Geological Survey Fort Collins Science Center. The focus of his graduate research is detection, assessment and monitoring of disturbance in temperate forest and woodland ecosystems. My work attempts to quantify vegetation and landscape change over time and elucidate the mechanisms responsible for change.

Assessment of Burn Severity and Post-Fire Araucaria-Nothofagus Regeneration in Tolhuaca National Park

Araucaria araucana is a long lived evergreen conifer tree that forms both pure and mixed stands with several deciduous species of Nothofagus in the Andean cordillera of southern Chile and Argentina. Fire is a primary disturbance agent in this forest type and its ecological legacy (both frequency and severity) is manifested on the current landscape through the mosaic of Araucaria-Nothofagus forest patches. During the fire season of 2001-2002, over 60% of Tolhuaca National Park (Chile) was impacted by wildfire. Our research attempts to quantify the impact of this high severity fire on forest mortality and regeneration within the park. Specifically, we evaluate the performance of the Normalized Burn Ratio as a measure of burn severity of the canopy of Araucaria-Nothofagus forest type and characterize post-fire regeneration. The Normalized Burn Ratio was calculated from two Landsat Enhanced Thematic Mapper scenes that were acquired before and after the fire. The change in the Normalized Burn Ratio was classified into four categories of burn severity. A field assessment was conducted in a portion of Tolhuaca National Park in March 2012 to collect data on pre-fire stand characteristics and post-fire regeneration over the last decade. Results suggest that burn severity as a function of Araucaria-Nothofagus mortality can be mapped accurately using remote sensing data. Furthermore, the classification identified a steep severity gradient on the landscape which was confirmed by the field data. Results on Araucaria-Nothofagus regeneration with respect to burn severity, landscape position and competition from other species will also be presented. The study uses an existing metric to quantify burn severity in a novel forest type. Furthermore, the study highlights the value of the remote sensing archive to fill data gaps and provide resource managers with inexpensive, spatially explicit data of disturbance events.

Balog, Cameron   (Poster #112)

Cameron M Balog Owner, Fire Management LLC Los Alamos, NM

First Order Fire Effects Burning Invasives along the Rio Grande River, TX

In August 2012, National Park Service fire and resource management personnel implemented the first phase of an adaptive management project to reduce invasive giant cane (Arundo donax) and salt cedar (Tamarix spp.) along the Rio Grande River in Big Bend National Park. It is believed that reducing the density of these exotic species will allow the Rio Grande to return to more normal flow patterns. The objective of the burn was to reduce biomass of these species allowing for resource crews to follow closely in the future with herbicide application. A total of 180 acres were treated over 9 river miles.

Balog, Cameron   (Poster #113)

(See biographical information, above.)

The National Fire Plan Build-Up: A Good Deal?

The National Fire Plan, enacted in 2000, resulted in a rapid build-up of federal wildland fire suppression resources with promises of landscape-level fuels treatments and containment of fire suppression costs across the United States. During the same period of time, fire suppression costs have skyrocketed as record-breaking fire seasons regularly burn more acres than ever. This analysis will examine whether the public has received a good return on their investment in federal firefighting resources. In this era of declining government agency budgets, it the current firefighting force sustainable?

Barbero, Renaud   (Poster #56)

Renaud Barbero Postdoctoral Researcher University of Idaho, USA   My research focuses on the mechanisms underlying climate variability and fire activity. Specific interests include wildfires and antecedent climate conditions, atmosphere-ocean processes in relation to different types of El Niño Southern Oscillations (ENSO), Pacific Decadal Oscillation (PDO) and their teleconnections to rainfall variability over SW Pacific. My current research is on the relationships between megafires, weather and climate in the eastern United States.

An Objective Examination of Santa Ana Wind Events and Wildfires in Southern California

Santa Ana winds (SAW) are among the most notorious fire-weather patterns in the United States and have resulted in widespread impacts over the last decade in southwestern California. Whereas SAW have widely been documented as contributing to the bulk of wildfire area burned in southern California, the lack of an objective means of diagnosing SAW over an extensive fire history has limited a full evaluation. This study employs an objective approach to identify SAW through synoptic-scale dynamic and thermodynamic factors using National Centers for Environmental Prediction (NCEP)/ National Center for Atmospheric Research (NCAR) reanalysis. Specifically, we find that a strong northeastward gradient in sea level pressure aligned with strong cold air advection in the lower-troposphere can be used in a two-parameter threshold model to identify days with extreme fire weather. Our SAW diagnostic is validated using fifteen years (1996-2010) of surface data from twenty-two Remote Automated Weather Stations across southwestern California. Results show strong agreement between synoptic factors and realizations of surface-based SAW characteristics and extreme fire weather as viewed through the Fosberg Fire Weather Index. This methodology is used retrospectively (1948-2010) to examine relationships between SAW events and wildfire in southwestern California over the past 63 years.

Bates, Jon   (Poster #68)

Jon Bates, Rangeland Ecologist, USDA-ARS.   Jon Bates has been with a ARS for 13 years with a research emphasis in post-fire ecology in sagebrush steppe and western juniper woodlands as well as evaluating post-disturbance grazing systems.

Livestock grazing after fire in the sagebrush steppe

Prescribed fire in rangeland ecosystems is applied for a variety of management objectives including increasing the productivity of forage species. Information on the impacts of grazing to community dynamics following fire in big sagebrush steppe is limited. We evaluated cattle grazing impacts over 10 growing seasons following prescribed fire on Wyoming big sagebrush steppe in eastern Oregon. Treatments have included timing of grazing after fire and grazing intensity (light, moderate, heavy). Timing of grazing treatments after fire included no grazing, two summer grazing applications, and two spring grazing applications. Treatment plots were burned in the fall of 2002. Timing treatments were applied from 2003-2007 (moderate grazing only), and grazing intensity trials were applied from 2007-2012. Vegetation responses in the treatments were evaluated by quantifying herbaceous canopy cover, density, standing crop and annual yield. With moderate grazing (30-50% utilization) herbaceous response variables did not differ among grazed treatments, regardless of when livestock were reintroduced after fire, when compared to the ungrazed burned treatment. All burn-grazing treatments had greater herbaceous cover, standing crop, and annual yield than unburned controls. Herbaceous cover, standing crop, and annual yield were greater in light (15-30% utilization) and moderate grazing treatments than heavy grazed (70% utilization) treatments. The results demonstrated that light to moderate livestock grazing after fire will not hinder the recovery of herbaceous plant communities in big sagebrush steppe. Heavy grazing reduces ground cover and herbaceous productivity within a 5–year period.

Battaglia, Mike (Poster #102)

Mike Battaglia is a Research Forester at the USFS Rocky Mountain Research Station in Fort Collins. His research focuses on developing and implementing innovative management strategies that address the challenges and issues faced by forest managers including forest restoration, fuels mitigation, and forest resilience across multiple spatial scales.

Short-term ecological effects of mastication fuels reduction treatments in Colorado

Over the past decade, fire managers have increased their use of mastication treatments, the on-site disposal of shrubs and small-diameter trees through chipping and shredding. Mastication is a relatively untested management practice that alters the chemical and physical conditions of the forest floor and may influence vegetation regrowth and fuel development for years or decades. Mulch additions increase both the load and continuity of surface fuels, and create a new forest floor layer that may act as a physical barrier to plant germination or as a nutrient sink that retards plant growth. Plant inhibition by mulch layers could be short-lived, and, with time plant growth might be stimulated by changes in soil resources and site conditions as mulch layers age. The long-term effectiveness of mulch treatments will depend on physical and chemical conditions of the mulch layer, how these influence forest floor and soil resources and the recovery of herbaceous and ladder fuels. Our study includes 18 sites in 4 forest types distributed across the southern Rocky Mountains and Colorado plateau. We apply a common study design to assess factors that control mulch treatment longevity and quantify how the ecological responses to mastication vary with mulch quantity and arrangement and through time. Our approach combines multi-year observational studies, which will identify temporal patterns in plant and soil responses to mastication treatments, with carefully designed manipulation experiments, which will help to elucidate the mechanisms responsible for the trends observed.

Bauer, Elizabeth (Poster #21)

Elizabeth A. Bauer   B.S. degree in Fire Ecology and Management   B.S. degree in Forest Resources   5th year at the University of Idaho   2012 Research Experience for Undergraduates (REU) Award Recipient

Removal of native seeds after wildfire in sagebrush habitat

The redistribution of seed post-fire is an integral part of reestablishing plant communities and is likely facilitated by granivorous animals, including rodents. However, the associations between rodents and seeds after fire have not been well established. Large, intense fires could affect rodent seed interactions through rodent mortality, changes in habitat structure, or seed availability. We examined patterns of seed removal for bluebunch wheatgrass (Pseudoroegneria spicata), Indian ricegrass (Achnatherum hymenoides), and Lewis flax (Linum lewisii) seed species, which are used in Emergency Stabilization and Rehabilitation treatments, following a wildland fire. In the recently burned Kinyon Fire near Castleford, ID, we selected three Artemisia and three grass patches to evaluate seed removal patterns. At each patch, we offered 20 seeds of each species in Petri dishes in the center of the unburned patch, edge of burn, and 20 and 30 m into the burned. After four nights, dishes were collected and the numbers of seeds removed were quantified. Seed removal was higher in Artemisia than in grass patches. For Artemisia patches, the center, edge and 30 m into the burn had similarly high amounts of seed removed, while seed removal at 20 m into the burn was relatively low. For grass patches, the center and 30 m into the burn had similarly high amounts of seed removed, slightly decreasing 20 m into the burn, while the edge had a minimal amount of seed removed. Our results show that rodents are actively foraging for seeds post fire, particularly in nearby Artemisia patches. However, no clear patterns have emerged for distance into unburned or burned areas. Granivorous rodents may significantly influence plant recovery post fire through redistribution of seed species in this particular fire.

Blankenship, Kori (Poster #80)

Kori Blankenship is an ecologist with The Nature Conservancy. Currently, Kori works on the LANDFIRE project applying its tools and data to solve conservation problems.

LANDFIRE Data for Land Management

LANDFIRE is a nationwide, multi-partner project designed to map and model vegetation, fire regimes and fuel characteristics for the entire United States. LANDFIRE products include a suite of more than 20 geospatial layers and vegetation dynamics models describing reference conditions for every ecological system mapped in the country. The comprehensive nature of the products and the consistent methods used to produce them make LANDFIRE datasets valuable for land management, conservation planning and treatment prioritization activities. LANDFIRE products were designed to work at national, regional and large sub-regional landscapes (such as fire management units) but tools and guidance are available to help users review and modify the data as needed for finer scale applications. In addition to explaining the LANDFIRE

process and products, this poster highlights real-world examples of applying the products for calculating nation-wide conservation risk, assessing state-wide forest conditions and supporting fire management activities.

Bonine, Holly   (Poster #30)

Graduate Student at the University of Texas, member of SAFE

Central Texas Student Association for Fire Ecology

The Central Texas Student Association for Fire Ecology was founded in September 2012 by graduate students at the University of Texas at Austin with the aims of creating an interdisciplinary network of fire ecologists throughout the central Texas region.

Bova, Anthony   (Poster #77)

Anthony Bova is a research associate at The Colorado State University Department of Forest & Rangeland Stewardship. He earned an M.S. in Environmental Engineering from the Ohio State University, where he received a NASA Fellowship, and has over ten years of experience as a modeler and experimentalist in the fields of wildland fire, fire effects and atmospheric dispersion.

Development and Evaluation of the Physics-based WIldland-Urban Interface Fire Dynamics Simulator

Given the state of current computer technology, physics-based fire models generally cannot provide simulations wildland fire spread quickly enough for operational use. However, because of their high physical fidelity, due especially to the coupling of fire and atmospheric dynamics, the utility of validated, physics-based models lies in their use to create "numerical experiments" that can then inform computationally faster, empirically-based models. As important, physics-based models can be used to develop new hypotheses regarding fire behavior that can assist in the design of future experiments. The open-source model suite, Wildland-Urban Interface Fire Dynamics Simulator (WFDS), contains a physics-based model of wildland fire that is built upon the structure fire model, FDS, developed by the National Institute of Standards and Technology. WFDS contains a boundary fuel model for simulating unresolved surface vegetation, and a fuel element model for simulating individual trees or vegetation canopies. Because it employs well-validated numerical models of combustion, fluid dynamics and thermal radiation, it is particularly suited for simulating fire spread and the effects of fire on flammable structures. WFDS validation uses measurements from laboratory-scale fire spread experiments and field-scale prescribed burns and wind measurements. Here, we discuss completed and ongoing validation efforts of the component models in WFDS (e.g., radiation) and of the complete model (e.g., fireline behavior).

Butler, Benjamin   (Poster #81)

Ben Butler is the Wildland Fire Decision Support System GIS Specialist, Based in Boise, ID at the National Interagency Fire Center (NIFC) Ben's position is within the Wildland Fire Management RD&A (WFM-RD&A). His responsibilities include the management of WFDSS geospatial data, integration of disparate interagency data sources into single data sets, and technical GIS support within the WFM-RD&A and to WFDSS. Ben holds an undergraduate degree in Environmental Geography and a Master of Natural Resources degree with a concentration in fire ecology. His interests and experience emphasize leveraging technology to solve natural resource and wildland fire issues. He spends his time with his wife and young son camping, fishing, hunting and enjoying the outdoors in the great state of Idaho.

Wildland Fire Decision Support System – Spatial Data Acquisition, Integration, and Management

The Wildland Fire Decision Support System (WFDSS) is a "data rich" application bringing spatial data to the forefront of decision-making on wildland fires. WFDSS leverages more than 45 disparate sources of geospatial and tabular data; ranging from building clusters to LANDFIRE fuels data and beyond, to support strategic fire management decisions. The Wildland Fire Management RD&A-WFDSS works collaboratively with interagency partners to assemble geospatial data from an array of sources to create and maintain merged data sets. These data sets are then utilized within the WFDSS application to paint a visual picture of the location, type, and number of values and/or assets within close proximity to a fire incident. By providing timely, accurate, and complete data sets the WFM RD&A and WFDSS strive to provide the right data at the right time to help raise situational awareness and better inform decision makers.

Caplan, Todd   (Poster #110)

Todd Caplan is a restoration ecologist based in Albuquerque, New Mexico with GeoSystems Analysis, Inc. He has spent the past 18 years implementing and monitoring floodplain habitat restoration projects along the Rio Grande and more recently along the Lower Colorado River. He has also served as principal investigator on several post-fire vegetation recovery monitoring projects, including projects to evaluate aerial seeding success following the Rodeo-Chediski Fire (AZ) and Paradise Fire (CA). Mr. Caplan currently provides technical scientific and habitat restoration management support to federal, state, tribal and non-profit clients throughout the southwest.

Post-Fire Rehabilitation of the Sacramento Wash Fire, Havasu National Wildlife Refuge, AZ

The Sacramento Wash Fire occurred in October 2008 on a densely vegetated alluvial fan abutting the Lower Colorado River near Topock Marsh, AZ. The fire burned approximately 240 acres of dense tamarisk (Tamarisk ramosissima and T. aphylla) and approximately 41 acres of emergent wetland vegetation. Post-fire site assessments were peformed to document soil types (Order 2 survey), map soil salinity (EM-38 survey) and map pre-fire vegetation distribution. These data were used to prioritize restoration areas, to design a soil salinity mitigation strategy and develop a revegetation plan. Extensive site preparation was required to remove dead and down T. aphylla trees from the proposed salinity mitigation / revegetion zone.   A groundwater well and solid set irrigation system were utilized on a 22-acre area to leach salts and bring salinity levels below the upper thresholds for growing screwbean mesquite trees. Once salinity levels were lowered to the desired level, the site was planted with 1700 potted trees and shrubs, and the site was seeded with salt-tolerant shrubs and grasses. This poster presents the sequence of major restoration planning and implementation steps, provides first year results, and discusses lessons learned.

Cassell, Brooke   (Poster #2)

Brooke A Cassell is a graduate student in the University of Washington's School of Environmental and Forest Sciences with the Pacific Wildland Fire Sciences Laboratory. She completed her master's thesis in June 2012 and is beginning her PhD studies this fall. Her research interests include fire ecology, dendrochronology, restoration ecology and using tropical hurricane debris as feedstock for biochar. She is also an ardent fungophile and co-owner of an urban gourmet mushroom farm.

Fire History of the Sierra de Manantlán Biosphere Reserve in Western México

A dendropyrochronological study was conducted in the Sierra de Manantlán Biosphere Reserve in western Mexico. Fire has been attributed as one of the most influential factors in vegetation and succession in the reserve with fire regimes ranging from frequent, low severity to infrequent, high severity across its heterogeneous, mountainous landscape. This study reconstructs fire frequency in the pine-dominated forests across 740 hectares in and around the Las Joyas Scientific Research Station, part of a core protected area of the reserve. A master tree-ring width chronology spanning 1881 – 2009 was compiled, and crossdating was used to create a composite fire history of 17 fire years between 1938 – 2009. This study establishes Pinus douglasiana as a viable species for tree-ring studies, despite its high occurrence of false, missing and diffuse rings, and serves both as a foundation for development of scientifically informed restoration and fire management plans and as valuable background for future fire ecology studies in the region.

Castillo, Maria   (Poster #8)

María Faviola Castillo, MSc PhD Student, University of Guadalajara I have been working with fire ecology and fire management for 10 years with diverse research projects focusing on development of management strategies and designing action plans for a natural protected area combining social and environmental needs. Lately I have focused more on conducting research on fire effects on vegetation in order to identify consequences of management on community assemblages, combining effect of fire regime shifts and fire management policies. Some publications in colaboration with Enrique Jardel: Villers-Ruiz L. and J. López-Blanco. 2004. Incendios forestales en México, métodos de evaluación. Flores-Garnica G. 2009. Regímenes de fuego en ecosistemas forestales de México. Also presentations at national and international conferences.

Tree species response to fire: a morpho-functional approach from a mountainous forest in the Sierra de Manantlan, Biosphere Reserve

Research on fire effects on vegetation has focused on individual species, making it difficult to achieve in high species richness areas, such as the mountainous pine-broadleaved forests of Sierra de Manantlán, western Mexico. It is central for fire management to understand and anticipate to spatial and temporal changes in species composition as a response to specific fire regime attributes, i.e. time since last fire and severity. The functional types approach has been recently applied to describe vegetation response to fire and it is based on a selection of life history attributes needed for survival, dispersal, estab-

lishment and maintenance in periodically burned areas. We selected 16 attributes for 52 tree species and grouped them into five morpho-functional types, using multivariate techniques of classification and ordination. After identifying three main types, conifers, oaks and broadleaved, the later was further classified into tolerant and persistent to fire. This sub-grouping indicates a gradient of tolerance to fire within the attributes and species considered. The resulting morpho-functional types suggest that the selected attributes could help to describe species assemblages responding to fire regime attributes. Classifying in large groups the high biodiversity of mountainous forests of México, not only allows summarizing the numerous species responses to fire, but also provides a mean to model and forecast the effect of altering fire regimes or the effect of different management strategies.

Chappell, Linda   (Poster #73)

Linda M. Chappell, Fire Ecologist, Dixie and Fishlake National Forests. Linda has assisted developing, implementing and monitoring managed fires in southern Utah on federal lands. She is interested in long-term vegetation monitoring and ecosystem health across the many fire-adapted ecosystems there.

How do you get the monitoring done? Use a Partnership.

How do we get the monitoring done? Use a Partnership. A partnership (contract) between the Student Conservation Association (SCA) and the Dixie and Fishlake National Forests allows both forests to inexpensively gather quality fire/fuels data while simultaneously training students. An SCA three-person crew is hired annually. The forests' fuels specialists prioritize projects and coordinate their data needs with the fire ecologist and fire ecologist intern. Our fire ecologist intern is the crew's liaison throughout the season and is often in the field with them. They camp out on most projects which reduces costs, increases safety through reduced travel time and maximizes time spent collecting and processing data.   The partnership's intent is to: Provide an affordable and practical way to plan and collect fuels and vegetation data.   Assess this data to meet fuels monitoring objectives   Provide a quality work and educational experience   Develop SCA student leadership, fuels inventory and monitoring skills, data collection, and   wildland fire management and monitoring skills.   At season's end, SCA students summarize data in FEAT/Firemon Integrated. Forests and districts may use these to refine burn prescriptions, adjust cutting/thinning parameters, etc. This is the crew's 6th year; we are now able to compare pre- and post-treatment fire and fuels effects.

Chavardes, Raphael   (Poster #10)

Raphael D Chavardes, MSc Student, University of British Columbia Author in recently published peer reviewed journal: Chavardes, R.D., L.D. Daniels, P.O. Waeber, J.L. Innes, and C.R. Nitschke (2012) Unstable climate-growth relations for white spruce in southwest Yukon, Canada. Climatic Change

The sensitivity of tree species at the site and landscape level to disturbance and climate change in the southwest Yukon, Canada

In the southwest Yukon, concerns of local forest managers to climate change include an increase in fire occurrence, a repetition of the recent spruce bark beetle epidemic and increasing failures in forest establishment. Over the 21st century, the cold and dry boreal forest landscape of the southwest Yukon is anticipating increasing precipitation and temperature. In our study multiple scales were considered to understand impacts of climate change and ecosystem processes on transient dynamics and interactions between tree species and disturbance. Site-level direct effects of climate change on species were not detected at the landscape-level; however, climate change interacting with fire directed species response. Using a stochastic landscape model (LANDIS-II) and a mechanistic species distribution model (TACA), our findings suggest white spruce will remain the dominant tree species in the Champagne and Aishihik Traditional Territory over the following 200 years even under high climate warming scenarios. Modeled changes to the region's fire regime indicate fire increases forest sensitivity to climate change, which is likely to reduce the dominance of white spruce in the landscape in favor of tree species with pioneer characteristics such as trembling aspen, balsam poplar, and lodgepole pine. Climate change will likely place ecosystems at greater risk to wildfire; however, it may reduce the landscape's susceptibility to future spruce bark beetle epidemics due to increases in landscape heterogeneity. Our study identified the need to consider the interaction between species, edaphic conditions, climate and fire when assessing the impacts of climate change on forest landscapes. Our study also illustrated that landscape structure will change more rapidly then its composition due to transient dynamics and species inertia.

Comfort, Emily   (Poster #86)

Emily Comfort is a PhD candidate at Oregon State University. She studies management options for wildfire risk reduction and wildlife habitat protection.

Northern Spotted Owl use of fire created and managed forest edges in southwest Oregon dry conifer forests

Loss of habitat from wildfire in the dry forest region of southwestern Oregon is a concern for the regional persistence of northern spotted owls (NSOs), a federally-listed, threatened species. However, NSOs in this region may be adapted to the historic mixed-severity fire regime. They may prefer "edge" habitat where prey species such as woodrats have access to both open grass and shrubs for foraging and forests with multiple canopy layers for cover and nesting. The historic mixed severity fire regime would likely have created abundant edges of this type. Previous research has suggested the amount of "edge" to be an important habitat variable for NSOs. However, in studies in which edge is used as a habitat variable, it is generally broadly characterized as the interface between suitable habitat (old forests) and "non-habitat." Non-habitat can include many different landscapes, from managed second growth forests to rock outcroppings.   Because it is likely that NSOs use some types of edges more than others, this research project attempts to better characterize the types of edge that NSOs select for in a landscape with both managed edges and fire-created edges. Telemetry data was collected on 23 NSOs following the 11,000 ha Timbered Rock fire. The fire burned through both a checker-board landscape with BLM and private timber lands and more contiguous Forest Service land, so there is an opportunity to observe use at a range of both managed and fire-created edges.

Comfort, Emily   (Poster #87)

(See biographical information, above.)

Collaboration and fire management: creating new trajectories for disturbed landscapes.

The Applegate Valley in southern Oregon, USA has experienced many changes in the last three hundred years. For approximately 4,000 years, Native American management likely included fire as a tool for protecting oaks from conifer encroachment, enhancing acorn crops, and improving hunting grounds by maintaining open grasslands, shrub fields, and oak savannahs and woodlands. During the early settlement periods, fire was likely used as a tool to clear land for grazing and mining. Since the late 1800's fire has generally been excluded from the landscape, first with a reduction in anthropogenic fire and finally with effective fire suppression by the 1950's. This change in fire regime, coupled with other changes in land management such as agriculture, grazing, and timber harvests have altered the composition and structure of the landscape. The current landscape has higher tree density and more homogenous tree composition. This structure is more likely to promote more severe, less complex, and larger fires in the future. In addition to these ecological concerns, the landscape has a complex socio-economic history that has left managers with multiple, conflicting mandates. The area is currently designated under the Northwest Forest Plan as an adaptive management area, which allows for management that tests alternative approaches to meet the goals of the plan. However, there are other restrictions that also direct the BLM to manage for northern spotted owl protection and for timber harvest to create income for counties.   The Pilot Joe project was implemented in 2012 after considerable public involvement, outreach, and scientific research as a demonstration project to test ecological forestry practices that can potentially balance the multiple management directives. Monitoring research is continuing to measure the effectiveness of the demonstration for achieving the ecological and socio-economic goals of the project.

Condon, Lea   (Poster #7)

Lea A. Condon is a PhD student in Botany and Plant Pathology at Oregon State University. Her masters thesis examined plant succession in a pinyon-juniper woodland following fire.

An examination of biological soil crust recovery following fire across the sagebrush steppe of the Intermountain West: Do they follow successional patterns?

Cheatgrass often dominates following fire in the Great Basin resulting in changes to nutrient and water balances. Water and nutrient availability are also affected by biological soil crusts, although little is known about biological soil crust recovery following fire. The primary objective of this study is to determine if biological crust species, specifically moss and lichen components, follow successional pathways after fire. We explore four hypotheses in this study: (1) the occurrence of biological soil crust species is primarily determined by the amount and timing of precipitation following fire as well as the nutrient composition of the soil and grazing intensity at the site, (2) associations between crust species are likely to show decreased similarity and increased diversity at the drier end of the precipitation gradient, (3) biological soil crust species

will show a range of tolerances to fire as demonstrated by abundance relative to unburned areas after accounting for abiotic conditions, fire severity and time since fire, (4) associations between crust species and plant species will indicate facilitation effects between the two. We are working at the regional scale, across a range of precipitation gradients while remaining within the sagebrush /salt desert scrub vegetation types and loamy soils. Findings will enable land managers to include the biological soil crusts in their prioritization of restoration efforts following fire. Preliminary work showed a greater decrease in the cover of moss species when compared with lichen species following fire. This might be due to observed associations between moss species and common woody species: Artemisia tridentata ssp. vaseyana (Rydb.) Beetle, Juniperus occidentalis Hook., and Purshia tridentata (Pursh) DC.

Cordell, Susan   (Poster #60)

Susan Cordell received her MS (1996) and PHD (1999) degrees in Botany from the University of Hawaii at Manoa. In 1999 she began a post doc, and now as a research ecologist, with the USDA FS, Institute of Pacific Islands Forestry. The focus of most of her professional career has been related to the conservation, preservation, and restoration of Hawaii and Pacific Island Ecosystems.

Practical tools for managing fire and restoring tropical dry forest landscapes on military lands in the Pacific

Tropical dry forest landscapes on military lands in the Pacific are declining at alarming rates, largely a result of fire that originates with invasion of native ecosystems by fire-prone invasive grasses and shrubs. These novel fire regimes have serious impacts to cultural and natural resources, and the health and safety of the region's citizens. We suggest that scientifically based tools developed to strategically inform natural resource management may be the most cost-effective approach to protect and restore native biodiversity, and reduce fuel loads, fire danger, and fire impacts while also controlling invasive species establishment and spread. We have combined newly developed remotely sensed information with field-based studies on the Island of Hawai'i to: 1) define the current condition and historical changes to tropical dry forests, 2) develop technology for restoration planning and ecosystem monitoring, 3) quantify restoration potential and develop restoration prescriptions for remnant dryland ecosystems, and 4.) develop effective fire risk reduction measures that protect forest fragments and initiate succession of degraded grasslands into native woody communities. Remotely sensed data have provided insights on historical dryland communities; aerial photography analysis indicate forest change over time; high-resolution ecosystem mapping has informed natural resource management planning efforts; and near real time web based satellite monitoring provides land managers an effective tool to evaluate fire danger. Field-based methods address the potential for restoration of native species to alter ecosystem structure to reduce fuel loads and fire danger, the major barriers to restoration across remnant native community types, and test the effectiveness of a firebreak design that incorporates traditional fuel-breaks grading into "greenstrips" planted with fire resistant native species. Results from this project benefit the military mission in the Pacific by increasing capacity and knowledge to restore native forests, thereby reducing wildfire and enhancing habitat for threatened and endangered species.

Creighton, Janean   (Poster #116)

Janean Creighton is an Associate Professor and Extension Specialist at Oregon State University College of Forestry. Janean's position focuses on increasing the information delivery and technology transfer capabilities of the U.S. Forest Service Pacific Northwest Research Station (PNW) fire and fuels researchers, and to integrate PNW station and other wildfire and fuels management into existing and emerging extension curricula, publications, and educational programs. Janean received her M.S. in Wildlife Biology and her Ph.D. in Environmental and Natural Resource Sciences, both from Washington State University. She is currently the Administrative Director for the Northwest Fire Science Consortium.

The Northwest Fire Science Consortium: Facilitating knowledge exchange and collaboration

The frequency of large wildfires in the forests and rangelands of the Pacific Northwest has increased over the past 50 years, and is expected to further increase in a changing climate. The number and types of managers and practitioners involved in wildfire management has also grown. Government agencies, land managers, air quality regulators, nonprofit organizations, community leaders, and others have diverse fire biophysical and social science needs. To protect and restore fire-adapted human and ecological communities and natural resources in the Northwest, we need a fire science delivery system to effectively disseminate and accelerate user adoption of pertinent information, knowledge, tools, and expertise. We also need a better system providing researchers with information about the needs of fire science users. The Northwest (NW) Fire Science Consortium is a comprehensive fire science delivery system designed to enhance the exchange of existing fire science and technologies throughout the region, and encourage fire and land management stakeholders to evaluate and adopt relevant fire science. The NW Consortium offers unique opportunities to increase cross disciplinary collaboration and

facilitate the delivery of fire science to diverse stakeholders and serve the diversity of needs in the Pacific Northwest. The effectiveness of the NW Consortium will be determined in large part by the degree to which new communication networks are established and existing ones strengthened. Methods and metrics for measuring these changes will involve both formative and summative evaluation. Once implemented, the activities and outcomes of the Consortium will be monitored and evaluated using a suite of approaches that will measure the short-, mid-, and long-term impacts.

Creighton, Janean   (Poster #117)

The Joint Fire Science Program (JFSP) goal is to accelerate the awareness, understanding, and adoption of wildland fire science information by federal, tribal, state, local, and private stakeholders within ecologically similar regions. Our vision is a national collaborative science delivery network.The Regional Consortia are local experts that help you get connected with other managers, practitioners and scientists working in your area. They not only provide the best fire information for your area, they demonstrate new knowledge in the field and much more.

Joint Fire Science Program: Knowledge Exchange Consortia

The Joint Fire Science Program's (JSFP) Knowledge Exchange Consortia Network is actively working to accelerate awareness, understanding, and adoption of wildland fire science information by federal, tribal, state, local and private stakeholders within ecologically similar regions. Our network of 14 regional consortia provides timely, accurate, and regionally relevant science-based information to assist with fire management challenges.

Cullinane Anthony, Bridget L.   (Poster #19)

Bridget L. Cullinane Anthony, Graduate Student, Biology Department, Central Michigan University.

Bird diversity patterns within remnant patches of biological legacies in jack pine dominated landscapes of northern Lower Michigan

The use of jack pine (Pinus banksiana Lamb.) plantations for Kirtland's warbler (Setophaga kirtlandii Baird) breeding habitat management has had the inadvertent consequence of creating a stand structure with conditions that are significantly different than the structure created by wildfire, the natural disturbance agent. This is partly because biological legacies are usually not maintained in these artificial systems or not maintained within the natural range of abundance. In the jack pine ecosystem of the northern Lower Peninsula of Michigan, biological legacy patches (stringers) are a unique landscape feature left behind after stand-replacing wildfire. With the Kirtland's warbler population levels exceeding set recovery limits for almost a decade, land managers have the opportunity to focus on the importance of stringers as refugia within the ecosystem and manage jack pine habitats more closely within their natural range of structural variability. The goal of this research is to examine the ecological value of stringers by comparing the avian community, vegetation structure, and arthropod abundance between stringers and the surrounding forest/plantation. Do stringers have unique bird communities relative to the surrounding habitat and is there seasonal variation? Can the variation in bird communities be explained by differences in the insect communities and/or the variation in vegetation structure and composition? These questions are being addressed by sampling across the northern Lower Peninsula of Michigan. The bird communities are being sampled using acoustic recorders and point counts. Insects are being sampled using pitfall traps and yellow sticky traps. Vegetation surveys were completed at each site to assess structural variability. Field work started in December 2011 and will be completed in August 2013. Preliminary data suggests a difference in bird community composition between stringers and the surrounding non-stringers and between the seasons. Preliminary vegetation data shows differences in structure and composition between stringer and non-stringers.

Davis, Raymond   (Poster #62)

Raymond J. Davis Old Forest and Northern Spotted Owl Monitoring Lead US Forest Service, Pacific Northwest Region Responsible for monitoring status and trends in old forests, spotted owl habitat, and spotted owl populations on federally manged lands within the Northwest Forest Plan area.   Recent publication - Davis, Raymond J.; Dugger, Katie M.; Mohoric, Shawne; Evers, Louisa; Aney, William C. 2011. Northwest Forest Plan—the first 15 years (1994–2008): status and trends of northern spotted owl populations and habitats.   Gen. Tech. Rep. PNW-GTR-850. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 147 p.

Habitat for Large Wildfires versus Habitat for Northern Spotted Owls

Monitoring since 1994 has shown that wildfires are the leading cause for loss of northern spotted owl nesting and roosting habitat on federally managed forests in the Pacific Northwest. This has sparked much interest on where within the range of the northern spotted owl do large wildfires usually occur, and how do those areas overlap with good owl habitat. To help answer this question, we used the same species distribution modeling (SDM) software that we used to model habitat suitability for northern spotted owls. But, instead we used it to model and map an environmental gradient of "wildfire suitability". The term "wildfire suitability", first coined by Drs. Marc-André Parisien and Max Mortiz in 2009, represents a gradient from low to high of a multivariate combination of environment conditions, including topography and climate, which relate to the likelihood of occurrence for large wildfires. A combination of steep slopes, hot and dry summer months in remote forested mountainous areas where lightning ignitions are common is more likely, through time, to incur large wildfires, as opposed to gentle, cool and moist areas within close proximity to roads and human access for fire suppression. This novel approach to mapping the fire environment has validated well in predicting where large wildfires, exceeding 1,000ac in size, have occurred within the owl's range over the last nine years. Perhaps it can inform managers on where to expect the next large wildfires?

Dean, Alison (Poster #63)

Central Oregon Fire Management Monitoring Program Coordinator

In and Out: Opportunistic Rapid Monitoring Ahead of the Pole Creek Fire

The Pole Creek Fire began on September 8, 2012, between the Three Sisters Wilderness of the Deschutes National Forest and the town of Sisters, Oregon. To reduce fire risk to the town, the incident management team decided to use a network of forest roads as containment lines. A variety of fuels reduction treatments had been done over prior years within the proposed burnout area, which presented the question of how those treatments would influence fire behavior and effects. We established Firemon monitoring plots ahead of burnout operations in treated and untreated plantations and older natural stands of ponderosa pine. Some plots were affected by drip torch ignition, but most experienced natural fire progression. We installed photo points and collected data on surface fuel load and tree vigor. Immediately post-burn, we replicated the photos and recorded first order fire effects including bole char and canopy scorch. The poster will show photos from this project, describe the fuel treatments and effects, and discuss the possible standardization of this kind of "quick and dirty" monitoring on large fires.

Defossé, Guillermo (Poster #47)

Guillermo E. Defossé is a University of Patagonia professor of Forest Ecology, and researcher at the Patagonian Forest Research and Extension Center in Esquel, Province of Chubut, Argentina. He holds a degree as an Agronomist Engineer (1979), earned at the University of La Plata in Argentina, and a MSc. in Range Sciences (1987) and a PhD in Forestry (1995), both earned at the University of Idaho in the United States. His main research interest is in range and forest fire ecology and management, productivity of rangelands, forest restoration, and CO2 emissions mitigation through forest practices. He has directed or co-directed 6 PhD dissertations and 7 MSc thesis, and published over 50 refereed publications and about a hundred technical reports in these areas of interest.

Wildfire history and prospective changes in fire regimes of Patagonia, Argentina

There are evidences that fire has always been present in all three main phytogeographical provinces of Patagonia, being more visible in the Andean forests than in the Monte or in the Patagonian Steppe. In the Andean Forest, fire scars present in old trees have been used to determine fire occurrence and frequency. In the Monte and the Patagonian steppe, historic reports of early explorers and settlers, and recent studies about the ecology of its vegetation, helped reconstruct former fire regimes. In the Monte region, old reports narrate that different areas were usually burned by Indians, who used to set fires for hunting and communication purposes. Recent studies also demonstrate that besides Indian ignitions, summer lightning may have played an important role in igniting fires in the whole region. In the Patagonian steppe and in the steppe-forest ecotone, fires were more frequent and less severe than in the Andean Forest. Fires were rather infrequent (return intervals of about 200 yr) but extremely severe, in the upper Nothofagus pumilio forests. In this region, there is evidence of fire 10,000 years B.P. in the early Holocene, where great magnitude fires took place in pure Nothofagus forest types. Further in the mid Holocene, precipitations increased towards the east and then the vegetation changed toward mixed Nothofagus dombeyii – Austrocedrus chilensis forests, changing also fire regimes to more frequent fires. Recent unprecedented changes in land use and climatic variation may have altered part of the natural balance in terms of fire frequency, continuity, severity and effects. The interaction among these factors is complex, and could make the comprehension of further fire responses of individual plants to this changing environment difficult. More studies will be necessary to understand how these unprecedented changes may affect future survival and growth of Patagonian native plants affected by wildfires.

Defossé, Guillermo   (Poster #90)

(See biographical information, above.)

Post-Fire Ecological Restoration in Southern Temperate Forests of Nothofagus pumilio in Patagonia, Argentina

Patagonian forests in Argentina cover about 3 million ha. Of them, 800 thousand ha correspond to Nothofagus pumilio (southern beech) forests. Nothofagus forests protect most watersheds of the region, and are exposed to grazing and fire disturbances. The re-establishment of Nothofagus after wildfire is negligible, because of the scarcity of seeds and the harsh post-fire environmental conditions. The objective of this study was to evaluate the potential of plantations to restore former N. pumilio landscapes. Three fire-disturbed sites, located in a latitudinal gradient (Esquel, 42° 56´ S - 71° 30' W, Monte Zeballos, 46° 49' S -71° 54' W, and Río Turbio, 51° 29' S - 72° 19' W), were selected for the study. The three sites receive less than 500 mm/yr of precipitation. In 2009, similarly grown, 3 years old N. pumilio seedlings were planted in 1 ha, large herbivores exclosures in Esquel (n=384) and Rio Turbio (n=352), in 2 x 2 rows of 24 seedlings each. In 2010, other plantations were done in Rio Turbio (n=352) and in Monte Zeballos (n=250), using 4 years old N. pumilio seedlings. To avoid browsing damages by the introduced European hare, each individual plant was protected by either polypropylene tubes (P), metallic mesh (MM), or plastic mesh (PM), leaving some plants unprotected as controls (CP). The different protection devices were randomly assigned among rows. The first growing season after plantation (2010) survival was similar (71%) for seedlings protected by P, MM, and PM in Esquel and Rio Turbio, respectively. In 2011, survival in Monte Zeballos was 65, 80 and 93 % for MM, P and PM, while in Rio Turbio it was 80, 90, 95, and 100 % for CP, MM, P, and PM, respectively. Results showed that seedling plantation may be a viable alternative to restore former Nothofagus pumilio landscapes.

DeJuilio, Jena   (Poster #31)

Jena DeJuilio, Fire Ecologist, BLM, hooked and landed a chinook salmon on a fly rod.

Monitoring fuels treatments in southern Oregon mixed chaparral and oak woodlands

Mixed chaparral and oak woodlands dominated by white leaf manzanita, buck brush ceanothus, and multi-aged Oregon white oak are a prominent plant community in southwestern Oregon. Historically, Native Americans had a hand in maintaining these plant communities, particularly oak woodlands. For 4,000 years, native people used fire to promote natural processes, such as acorn production, stimulating forage for large animals, and promotion of food and medicinal plants. Settlement by Europeans significantly altered the way fire was used across the landscape. Frequent high-intensity fire became an effective tool to clear the land for grazing and mining.Pre Euro-American fire histories in these plant communities are less understood than in coniferous forests, though with lightning acting as a reliable ignition source, presumably fire suppression has changed the interaction of fire with all plant communities.The absence of fire has resulted in greater fuel loading and more homogenous vegetative patterns across the landscape, increasing the likelihood of large high-severity fires. In chaparral encroached oak woodland/savannah, the probability for a stand replacing high severity fire event is great. For this reason, and due to their characteristic proximity to populated areas, oak woodlands are frequently targeted for hazardous fuel treatments by the Bureau of Land Management (BLM) in southwest Oregon with mechanical and manual techniques.   In 2010 Medford District fuels monitoring plots (i.e. FIREMON) were re-visited approximately five years after treatment in four different oak woodland units in the Ashland Resource Area. The plots were stratified for analysis into two treatment groups, Mechanical mastication (M-M) and Handpile and Burn (HPB). We look to see how fuel models differ 5 years after treatment and if objectives for reducing surface, ladder and crown fuels are still effective. We also present changes in vegetative responses in dominant forb, herb, shrub and tree species, including seedling and shrub regeneration.

DeSiervo, Melissa   (Poster #25)

My name is Melissa DeSiervo. I am a first year graduate student in the Biology Department at Humboldt State University. Before coming to Humboldt State I worked on a wetland restoration project at Point Reyes National Seashore, and was a co-author on a poster presentation at the California Native Plant Society Conference entitled "Post-Restoration Plant Community Assembly Patterns on the Giocomini Wetland Restoration Project".

Inventory and monitoring of postfire forest succession on serpentine and non-serpentine soils of the Rich Fire, Plumas National Forest. 2012.

Wildfire is one of the most important ecological disturbances throughout California and plays a major role in the diversity and structure of many plant communities. While the effects of fire are well-documented in many ecosystems, the relationship between wildfire and plant communities on ultramafic (i.e., "serpentine") soils remains poorly understood. Serpentine ecosystems are characterized by their nutrient-poor soils which support lower levels of community productiv-

ity, but a high proportion of rare and endemic plant taxa. Our study aims to fill in gaps in our understanding of fire and serpentine ecosystems, using post-fire data from the 2008 Rich Fire in the Plumas National Forest. The Rich Fire burned approximately 2400 hectares in the Feather River Canyon, including 1200 hectares of mixed conifer forest on serpentine substrate. To collect data on trees, vegetation composition, surface cover and downed woody materials, we employed the Common Stand Exam plot protocol established by the U.S. Forest Service. We also collected data on seedlings, saplings and hardwood resprouts using the Forest Service Regeneration Plot protocol. A total of 89 plots were established within the fire perimeter, 46 on serpentine substrate, and 43 on non-serpentine substrate. Burned plots were categorized based on a fire intensity scale 1-5. We also include data from 24 unburned sites immediately outside the fire perimeter, 12 on each substrate type. Preliminary results show a variety of differences in vegetation community structure on serpentine and nonserpentine substrates. As predicted, serpentine sites contained less tree density and average tree height was significantly shorter. On both soil types, fire severity was an important indicator of plant community change. Shrub and hardwood resprout percent cover increased dramatically on both soil types with increasing fire intensity, however the dominate species differed significantly based on soil type. Quercus spp. hardwood resprouts for example, constituted a larger proportion of nonserpentine sites, whereas serpentine sites were dominated by seed-recruiting species such as Ceanothus cuneatus. Forb and graminoid cover were also were distinguished by soil type and fire severity. Our study shows that there are substantial differences in the way that serpentine vegetation responds to fire, and management of these ecosystems needs to be tailored accordingly.

Dillon, Gregory   (Poster #38)

Gregory K. Dillon is a spatial fire analyst with the USDA Forest Service's Fire Modeling Institute in Missoula, MT. Prior joining FMI in 2011, Greg was the team lead for potential vegetation mapping on the National LANDFIRE project, and also worked on research focused on examining the influences of topography and climate on burn severity in the western U.S. He has a B.S. in Geography from James Madison University (Harrisonburg, VA), and an M.A. in Geography from the University of Wyoming. Information about publications and current projects can be found at: http://www.firelab.org/staff-directory/153.

Potential for high severity fire: a new 30m raster dataset for the western United States

The Fire Severity Mapping System project (FIRESEV) is geared toward providing fire managers across the western United States critical information about the potential ecological effects of wildland fire at multiple levels of thematic, spatial, and temporal detail. A major component of FIRESEV is a comprehensive map of the western U.S. depicting the potential for fires to burn with high severity if they should occur. Developed as a 30m-resolution raster dataset, the map is intended to be an online resource that managers can download and use to evaluate the potential ecological effects associated with new and potential fire events. Using satellite-derived burn severity data from over 7,000 fires that burned from 1984 to 2007, together with geospatial topography, fuel moisture, and vegetation data, we produced statistical models using the Random Forest machine learning algorithm. We developed Random Forest models separately for forested and non-forested settings in each of 17 mapping regions. For each model, we selected the set of predictor variables (i.e., landscape characteristics) that provided the best possible predictions of high severity fire occurrence. Cross-validated classification accuracies for individual models ranged from 65% to 83% for forest models, and 69% to 82% for non-forest models. We used the Random Forest models to predict, for every 30m pixel in the West, the potential for high severity fire, conditional on that pixel experiencing fire at a particular percentile level of a 1000-hour fuel moisture index (where higher percentiles equal dryer conditions). The products representing the potential for high severity fire at the 90th percentile are now complete and will be available online by December 2012 at http://www.firelab.org/research-projects/fire-ecology/128-firesev.

Drury, Stacy   (Poster #58)

Stacy Drury has been active in applied research for the past 20 years. He has worked for research organizations including the Fire and Environmental Research Applications (FERA), Instituto de Silvicultura e Madera (ISIMA), and the Missoula Fire Lab. Stacy has experience investigating fuel consumption, smoke emissions, and fire occurrence throughout North America. Stacy is the Senior Fire Ecologist at Sonoma Technology, Inc. Stacy's projects include Senior Science lead on the Interagency Fuels Treatment Decision Support System (IFTDSS), Co-PI on the Real Time Assessment of Fire Weather Accuracy project, and Senior Scientist on the Smoke Emissions Modeling Intercomparison Project (SEMIP).

Real-Time Analysis of Fire Weather Prediction Accuracy: Year 2 Progress

Fire weather forecasters, fire planners, and decision makers do not have easy access to information needed to verify the accuracy of fire weather forecasts and the products that rely on them to predict ignition potential. The Joint Fire Science

Program (JFSP) funded development of a system that produces intuitive, easily understandable meteorological model performance assessments and provides end users with real time information about meteorological model bias, model reliability, and overall performance of fire weather forecasts. We have produced a system that ingests data from RAWS and ASOS weather stations; analyzes the difference between observed and forecasted weather data to identify accuracy, bias, and uncertainty; and displays the analysis in an online map system. Users can view current, historical, and forecast weather data from WRF, NAM, NDFD, and GFS weather models for each weather station. In addition, observed and forecasted fuel moisture and fire danger rating indices using the National Fire Danger Rating System (NFDRS) and the Canadian Forest Fire Danger Rating System (CFFDRS) are displayed. Simple statistical analyses allow users to identify model bias and model accuracy. We have found that fire weather accuracy can be improved locally by using a simple mean bias measure. Every day for each station, the system calculates a mean bias measure over the past seven days. We apply this bias measure to the forecasted fire weather variables, such as air temperature and relative humidity, to adjust the fire weather metrics spatially and temporally in light of local model performance.

Duerkop, Peter   (Poster #15)

Peter Duerkop is a graduate assistant at St. Cloud State University in St. Cloud, MN. He earned a B.S. in Wildlife Ecology & Management in 2009 from the University of Wisconsin – Stevens Point, which is also where he received his initial wildland firefighter training. Since then, he has worked for 5 different units of the National Park Service and the U.S. Fish and Wildlife Service in Wisconsin, Minnesota and Texas as a biological science technician and/or fire crew member. A professional goal of his is to integrate fire science and fire operations. Pete's hobbies include music, camping, craft beer, hunting ruffed grouse and canoeing.

Quantifying the Effectiveness of Prescribed Fire Regimes to Restore Midwestern Oak Savanna

Remnant Midwestern oak savanna is present in only 0.02% of its former range due to conversion to agriculture, the extirpation of native browsers (elk, bison) as well as fire suppression. Sherburne National Wildlife Refuge (Zimmerman, MN) has some of the best oak savanna remnants in existence today and is working to restore most of its uplands to a savanna habitat type. Prescribed fire has been the primary management tool used in this process. Management units are burned every 2-6 years based on prescribed weather conditions and personnel requirements. Vegetation data has been collected beginning in 1993 according the National Park Service's Fire Monitoring Handbook. Sample plots in the refuge are divided into three strata: grassland, savanna, and forest. Herbaceous cover, as well as tree size and species measurements is taken 1 and 5 years after burn treatments. Frequency is the most often used aspect of fire history used to quantify fire regime and is usually applied as a number of treatments over time. This study attempts to determine whether the variability in the amount of time between treatments has an impact on vegetation response. It is expected that the more variable the fire interval, the higher the plant diversity values will be. Vegetation response measures (e.g. % native grasses/forbs/shrubs, basal area) are used to observe whether restoration goals are being met. Abundances of non-desirable species are also measured to determine whether degraded habitats are improving.

Fairbanks, Rich   (Poster #105)

The authors have worked in a variety of fire-related positions in the U.S. Forest Service, National Park Service, California FireSafe Councils, and nonprofit conservation organizations focused on fire ecology and management.

Firefighters United for Safety, Ethics, and Ecology (FUSEE): Torchbearers for a New Fire Management Paradigm

Firefighters United for Safety, Ethics, and Ecology (FUSEE) is a nonprofit organization promoting safe, ethical, ecological wildland fire management. FUSEE members include current, former, and retired wildland firefighters, other fire management specialists, fire scientists and educators, forest conservationists, and other citizens who support FUSEE's holistic fire management vision.   FUSEE's primary mission is to provide public education and policy advocacy in support of a new, emerging paradigm that seeks to holistically manage wildland fire for social and ecological benefits instead of simply "fighting" it across the landscape. We seek to enable fire management workers to perform their duties with the highest professional, ethical, and environmental standards. Our long-term goal is the creation of fire-compatible communities able to live safely and sustainably within fire-permeable landscapes.   Inspired by Aldo Leopold's "Land Ethic," FUSEE advocates for a new "Fire Ethic" in fire management policies and practices: A thing is right when it contributes to the safety of firefighters and the public, ethical use of public resources, environmental protection of fire-affected landscapes, and ecological restoration of fire-dependent ecosystems. It is wrong when it tends otherwise.   This poster will display FUSEE's philosophy, mission, research, education, and advocacy projects. Elaboration of some key FUSEE concepts will be featured, including: the FUSEE triad of safety, ethics and ecology; re-identifying firefighters as fire-guiders; expanding community

wildfire protection programs into more inclusive goals of community fire preparation; recreating fire-compatible communities and restoring fire-permeable landscapes.

Fornwalt, Paula (Poster #74)

Paula Fornwalt has been a Research Ecologist with the USDA Forest Service's Rocky Mountain Research Station since 2010. Her research examines how natural and human disturbances impact plant populations and communities in Rocky Mountain forests.

The Front Range Forest Reconstruction Network: Reconstructing Forest Structure and Fire History in Front Range Montane Forests to Inform Forest Restoration Activities

Quantitative data on historical forest structure (species composition, density, basal area, size and age distributions, and spatial arrangement) are rare or nonexistent for ponderosa pine – dominated forests of the Colorado Front Range. In response to this lack of quantitative data and also to the need to implement a proactive forest restoration program to reduce the risk of uncharacteristically severe wildfires, a project was initiated in spring 2012 by the Arapaho - Roosevelt and Pike - San Isabel National Forests, Boulder County Parks and Open Space, Rocky Mountain Research Station, Colorado Forest Restoration Institute, and Rocky Mountain Tree-Ring Research. The main goal of this project – The Front Range Forest Reconstruction Network – is to develop these historical metrics for Front Range montane forests and to tie them to environmental gradients so that ongoing ecological restoration efforts can be better informed. We are using a consistent sampling protocol to map all pre-settlement tree evidence in 0.5-ha plots, to age subsamples of pre- and post-settlement trees in the plots, and to collect fire-scar evidence when encountered in or near the plots. During the first field season in summer 2012, almost 80 plots were sampled, primarily in the northern end of the Front Range. An additional field season in 2013 is planned for the southern end, with a final goal of ~150 total plots to capture the range of variability across the elevational, latitudinal, moisture, and productivity gradients present in the region.

Gdula, Eric (Poster #29)

Eric Gdula, Fire GIS Specialist, Grand Canyon National Park. I have worked at Grand Canyon for the past 12 years. Previous work includes being the GIS Coordinator for the Southeast Utah group of parks (Arches, Canyonlands, and Natural Bridges), as well as being the GIS specialist at Isle Royale National Park. A portion of my work includes burn severity mapping. I've developed some techniques at Grand Canyon that have lead to customizing the Monitoring Trends in Burn Severity data which result in very accurate maps.

Innovative Uses of Monitoring Trends in Burn Severity (MTBS) data at Grand Canyon National Park.

Grand Canyon National Park has an active fire program. The current 10 year average annual fire activity is 11,200 acres per year. To date, the Monitoring Trends in Burn Severity (MTBS) program and Grand Canyon National Park staff have mapped burn severity for 50 fires, totaling over 116,000 acres. A critical part of the fire program has been using the MTBS data to assist with fire management decisions. The park uses this severity data in a number of interesting ways, including pre fire planning, at the inception of fires, during protracted events, and post fire analysis. Examples of each of these uses will be discussed during this talk.

Godwin, Daniel (Poster #28)

University of Missouri - Columbia SAFE Chapter Poster

Mizzou SAFE started in 2011 and has since been focusing on providing training opportunities for students, providing support for local fire management agencies, and improving the quality of our fire science education. We have assisted on a number of prescribed fires and have a small but growing fire cache.

Goodfellow, Stepehen (Poster #34)

Stephen F. Austin State University SAFE Chapter

This poster highlights the Stephen F. Austin State University Chapter Activities and members

Goolsby, Reginald   (Poster #104)

Reginald Goolsby is a fire ecologist trainee on the Francis Marion and Sumter National Forest in South Carolina. He received his B.A. in communications from Furman University and his Masters in Forestry Resources from Clemson University.

Providing science to managers: the Francis Marion and Sumter National forest prescribed fire prioritization model

As targets increase, so do the demands on fire management officers (FMOs) to prioritize treatment areas. Prescribed fires accomplish multiple objectives including reducing hazardous fuels, improving wildlife habitat, aiding listed species and increasing resource access. Researchers have provided guidance to help FMOs reintroduce fire into the landscape most appropriately; yet dialogue between scientists and managers is still not what it should be. FMOs need knowledge in a format understood by the "boots on the ground" rather than the scientific community. At the request of its FMOs, The Francis Marion and Sumter National Forest developed a fire prioritization model founded on fire science and understood by management to answer the questions of "when to burn, where to burn, how to burn, and why to burn."   The burn prioritization model ranks treatment areas on ecological and logistical scores and allows users to set optimal burning constraints such as days since rain, KDBI, relative humidity, temperature, and season of burn to achieved desired resource goals. The goal of many burns is ecological restoration therefore some criteria such as percent of fire-dependent vegetation, departure from desired condition, and presence of listed species were factored in. Some logistical score criteria factored in were ignition patterns, fireline construction and holding, road closures, smoke management and personnel requirements.   The model allows managers to enter day of burn environmental conditions which the model provides the user with the optimum location to burn to achieve desired management results.   The advantages of this model over others is that it closes the gap that has divided researchers and science from the on the ground technicians actually managing the land. Researchers now have an interactive way to descriptively describe the best optimal way to achieve resource objectives in a format that easy to understand by the managers applying the tool.

Haffey, Collin   (Poster #13)

Collin Haffey MS Student   Environmental Science and Policy Northern Arizona University Flagstaff, AZ   I have been working in the Southwest US for the last five years, since graduating from the University of Iowa. My work has focused broadly on forest and arid landscape ecology. I recently presented, "Spatial Patterns of a Jemez Mountains Fire Scar Record," at the Southwest AFE meeting in early 2012. I am interested in vegetation responses following high severity fire. Currently I am pursuing a MS in Environmental Science and Policy at Northern Arizona University.

Conceptual Model of Tree Regeneration Following Stand Replacing Fires in Arizona and New Mexico Forests

Since the 1970s the size of high-severity forest fires has increased in the Southwest United States, resulting in a proliferation of large, continuous treeless areas with few remnant live trees to provide seed sources for regeneration. These larger patches of tree-killing fires likely are due to a variety of factors including historical forest densification, natural drought cycles, and recent warming due to climate change. The few available studies of tree regeneration over the past ~50 years in historic post-fire treeless areas have shown mixed results when examining whether or not these landscape patches returned to the pre-fire forest vegetation type. Given ongoing and projected future climate change stresses, a return to pre-fire forest types may be unlikely in coming decades. We examine drivers of post-high-severity wildfire recovery in two parts. First, we examine several recent large wildfires and categorized the treeless area patch differences according to several abiotic factors, including distance from seed source, normalized elevation range index (elevation of the patch divided by the elevation range for a species), and aspect. We examine regenerative characteristics of pre-fire dominant tree species to create a conceptual model that predicts the extent of forest regeneration over the next century. In cases where published data are not available, the regeneration parameters are based on expert opinion. Our conceptual model takes into account recent climate change research suggesting a more rapid shift of the climate window for dominant tree species than was previously anticipated. Using a preliminary version of this model, we create maps showing the predicted extent of regeneration for several hypothetical fire scenarios. Forest managers may be interested in this approach because it addresses post-fire conservation issues, including reforestation and future wildlife habitats, in a testable, predictive framework.

Hamman, Sarah   (Poster #106)

Sarah is the Restoration Ecologist for the Center for Natural Lands Management. Her work is aimed at restoring rare species habitat in PNW prairies using rigorous science and careful conservation planning. Sarah holds a B.A. in Biology from Wittenberg University and a Ph.D. in Ecology from Colorado State University. Most of her training and experience has

been in ecosystem ecology, with a focus on fire effects on forest and grassland soils. She is also an adjunct professor at The Evergreen State College, where she teaches Fire Science and Society and Restoration Ecology for the Master's of Environmental Studies program.

The Washington Prescribed Fire Council: Developing opportunities for collaboration and cooperation to enhance the safe, effective and appropriate use of prescribed fire throughout Washington

A century of fire suppression and exclusion in many ecosystems throughout the United States has led to altered fuel types and hazardous fuel loads, increasing the risk of high severity wildfire and leading to altered ecosystem structure and functioning. Managers have identified that carefully applied prescribed fire can be an effective approach for safely reducing fuel loads and restoring native habitat; however, practitioners still face major challenges with prescribed fire implementation. Sufficient trained personnel, funding, supportive air quality regulations, general public support and accurate information on fire effects are lacking. Because of this, effective re-introduction of fire requires cross-agency and cross-border collaborations that provide shared resources, mutually beneficial gains in knowledge and a common powerful voice to garner social and political support. The newly formed Washington Prescribed Fire Council (WA PFC) provides an educated, active body to assist fire practitioners, policymakers, regulators and citizens with issues surrounding smoke management, public outreach and education, access to resources, cross-agency collaboration and political support. The first annual WA PFC conference brought over 130 people from 46 different organizations together to discuss the direction and goals of the Council and to identify priority needs for the Washington prescribed fire community. The Council is currently forming its Steering Committee and will be hosting another conference in spring 2013 to develop strategies for addressing current challenges to using prescribed fire across the state.

Heide, Sarah   (Poster #107)

Sarah Crocker Heide Fire Ecolgist/Fuels Specialist Bureau of Land Managment - Boise Idaho Graduate of University of Wyoming and University of Idaho - BS and MS in Rangeland Ecology and Management

Developing and Implementing a Neighborhood Fuelbreak in the Foothills North of Boise Idaho

The Warm Springs Mesa Neighborhood Association, in partnership with Homer Wise & Sons, the City of Boise, the Bureau of Land Management, and the Southwest Idaho Resource Conservation and Development Council have been working towards making the Warm Springs Mesa subdivision in the foothills north of Boise less susceptible to the devastating effects of a fast-moving wildfire. One of the many projects initiated by this neighborhood, a nationally recognized Firewise Community, includes the creation of a fuelbreak surrounding the subdivision. Neighborhood meetings, newsletters, flyers, signs, and newspaper notices were used to inform and educate the neighbors and the general public about the need for a fuelbreak, the tools to be used for its' creation, and the timing of various activities. Invasive annual grasses (cheatgrass and medusahead wildrye) had invaded the native plant community surrounding the subdivision creating a continuous bed of fine fuel ripe for ignition and a fast moving wildfire. The neighborhood fuelbreak is an average of 500 feet wide starting at the end of individual homeowners' properties along the outside of the subdivision and stretching out towards the wildland. The exterior boundary of the fuelbreak is defined by roads, trails, topography, and land ownership.   Annual grass control was achieved with an application of the herbicide Plateau® (imazapic) using all-terrain vehicles mounted with boomless sprayers in the fall of 2011. Seeding of native grasses and forbs that stay green longer into the fire season occurred in the fall of both 2011 and 2012 using broadcast spreaders in rougher terrain and a rangeland drill where topography allowed. In the spring of 2012, a herd of goats was used to reduce vegetation and annual grass seed in the 150 foot wide strip immediately adjacent to homes where the herbicide could not be used due to safety and liability concerns. Free curbside pick-up of vegetation, cut and removed from individual properties by homeowners while creating defensible space, was provided to the neighborhood in the summer of 2012 with plans to continue this service in 2013. Vegetation monitoring plots established in the fuelbreak prior to implementation will be re-read into the future. Other potential firewise projects include a retaining wall along Warm Springs Avenue, an emergency notification system for the neighborhood, and a firewise demonstration garden.

Helmbrecht, Don   (Poster #71)

Don has worked for the USFS TEAMS Enterprise Unit as a wildland fire analyst since 2010. Prior to this Don worked as a geospatial analyst at the USFS Fire Sciences Laboratory, GIS program manager at the University of Montana's National Center for Landscape Fire Analysis, and as a member of an Interagency Hotshot Crew. Don holds a Master of Science in Forestry from the University of Montana.

Assessing Wildfire Risk to Diverse and Resilient Vegetation on the Bridger-Teton National Forest

Wildfire risk assessment quantifies the expected threat or benefit of wildfire to highly valued resources and assets. Both market (e.g., residential structures, campgrounds) and spatially discrete nonmarket (e.g., old growth, spotted owl core habitat) resources and assets are commonly assessed. Characterizing and quantifying landscape-level ecological resources such as diverse and resilient vegetation, which are not as easily spatially defined, requires integrating multiple assessment methodologies.   We quantified the risk to diverse and resilient vegetation from wildfire on the Bridger-Teton National Forest by integrating an assessment of landscape-level vegetation condition with an emerging wildfire risk assessment framework. To assess vegetation condition, we compared the current distribution of vegetation succession classes to a reference distribution representing the historical range of variation using the Fire Regime Condition Class Mapping Tool. The risk assessment framework included modeling wildfire hazard with the FSim large fire modeling system, and developing expert-based response functions that characterize how the status (i.e., deficit, similar, or surplus) of vegetation succession classes within individual biophysical settings and different fire intensity levels may jointly influence fire effects. From these efforts, we were able to then derive spatially resolved estimates of expected net value change to diverse and resilient vegetation. Results suggest that large areas of the landscape are expected to have a net benefit from wildfire. This information can prove useful for a range of fire management planning activities, in particular response to wildland fire incidents.

Hernandez, Adam   (Poster #36)

Adam Hernandez,District Prescribed fire Specialist/US Forest Service Dr. Bob Loveless, Professor and Technical Specialist/Washington Institute

Are we Safer?

Responding to a perceived need to reduce firefighter death and injury through cognitive recognition of human errors in decision-making, a human factors/leadership (HF/L) training program (L-courses) was initiated in 2000 by the National Wildfire Coordinating Group. This training has attempted to reduce human errors within the wildland fire culture, effectively leading to an expected outcome of reducing the likelihood of injuries, entrapments and fatalities. A series of six courses are available during a firefighter's career. Using available data sources, at the end of 2009, over 40% of federal wildland firefighters have had at least one L-course but only 0.11% of firefighters had completed all six courses. Firefighters take successional L-courses on average every two years. Using Poisson regression, the annual rate of wildfire entrapments (number/1000 person-hours exposed on the fireline) was examined for six years prior and ten years after program implementation. Since program inception, rate ratio estimates indicate an 80% (0.49-0.92, =0.05) reduction in the annual entrapment rate for all (federal and non-federal) wildland firefighters after controlling for variation in annual acres burned and exposure time. A similar 73% (0.13-0.92) reduction was observed for federal firefighters. While HF/L training was primarily implemented to reduce human errors and increase safety, other changes during the time period examined could account for the observed entrapment decreases but were not included in this study. These include improved weather forecasts, increased oversight in qualifications standards, departure from full perimeter control tactics and implementing assignment turndown protocols.

Hoff, Valentijn   (Poster #35)

University of Montana

University of Montana Chapter of SAFE

The members of the student chapter of AFE at the University of Montana have been busy this year. They organized social events for students and fire professionals, did defensible space counselling for private landowners and participated in several prescribed burns. The well attended monthly meetings are used to prepare for another productive year in 2013.

Holland, Colleen

Colleen Holland, Assistant Lead Fire Effects Monitor at Evergaldes National Park, graduated from the University of Wisconsin-Stevens Point with a bachlor Wildlife Ecology and Management.

The Role of Fire in a Changing Ecosystem: Investigating the Interaction between Fire and Lygodium microphyllum in Everglades National Park

In Everglades National Park, Old World Climbing Fern (Lygodium microphyllum) is invading the coastal prairie habitat on the west coast of the park. L. microphyllum creates dense mats in the marshes and tree islands, shading out native species

and limiting the spread of fire, a natural disturbance regime in these prairies. In 2011, the Fire and Exotic management programs at Everglades NP created an inter-departmental working group to coordinate and expand monitoring projects to further understand the interaction between fire treatments and L. microphyllum response. Additional protocols were added to existing fire effects monitoring plots in the coastal prairies to assess landscape level changes in L. microphyllum cover. Because these plots were not designed to compare similar burned and unburned areas, the working group initiated a two-year, paired plot, monitoring study to better understand L. microphyllum response in burned versus unburned areas. In the paired plot study, initial results in line intercept and ocular cover estimation methods show conflicting trends in L. microphyllum cover between burned and unburned plots. L. microphyllum occupation of available habitat was higher in unburned areas as compared to burned areas. Fecundity, as measured by amount of fertile leaves, was higher in burned areas immediately post burn, but these plots experienced a more dramatic decline following peak spore production than unburned plots. To complement ongoing field studies, Everglades NP is working with a research professor at Florida International University who will compare biomass and fecundity changes between burned and unburned plants, and test spore viability after heat exposure in controlled lab experiments.

Hudec, Jessica   (Poster #95)

Jessica Hudec is a Natural Resource Specialist working in fuels and fire ecology on the Gifford Pinchot and Mt. Hood National Forests of the Pacific Northwest Region, USA. Jessica started her Forest Service career in 2003 as a firefighter and still enjoys going out on 20-person handcrews. Jessica completed a Master of Science degree in Forest Resources at the University of Washington in 2011. Jessica's graduate research is documented in the 2012 Forest Ecology and Management publication "Fuel variability following wildfire in forests with mixed severity fire regimes, Cascade Range, USA".

Landscape-level fuels treatment strategies in the Pacific Northwest, USA

National Forests of the Pacific Northwest Region have created Strategic Fuels Treatment Plans to address the need for landscape-level fuels management. Objectives of the plans include   1. Establishing strategies for fuels programs that are useful in out-year planning and help guide the purpose and need for interdisciplinary projects. 2. Designing forest landscapes with networks of fuel breaks and natural openings that, in the event of a wildfire, will promote   a. Increased public and firefighter safety.   b. Decreased management costs.   c. Increased suppression effectiveness in protecting private and federal improvements, timber, and sensitive natural resources.   d. Use of prescribed natural fire to restore forest health, resilience, and condition class.   e. Disturbances in block sizes representative of the natural disturbance regime.   Strategic Fuels Treatment Plans prioritize community protection from wildfire and restoration and maintenance of ecosystem resilience. Furthermore, Plans aim to support management activities that work toward the desired future condition of Pacific Northwest forests: healthy, diverse, and resilient landscapes that can adapt to future disturbances with minimal negative effects to ecosystems.   Strategic Fuels Treatment Plans spatially identify fuels treatments in two major areas: 1. Buffers to private lands and high value resources including timber, infrastructure, critical habitat, and municipal watersheds that a. Create opportunities for safe and effective fire suppression.   b. Add depth to private land boundaries. 2. Fuelbreaks on roads, ridges and around wilderness areas that   a. Compartmentalize the landscape into blocks that are spatially representative of natural disturbances.   b. Facilitate indirect fire suppression and reduce wildfire costs.   c. Enable landscape restoration that adds depth to fuelbreaks using fire and other vegetative treatments.   Local fire management personnel and resources specialists were consulted at each district to create maps of suggested treatment areas.

Huffman, Mary   (Poster #100)

Mary Huffman serves as Landscape Conservation Network Director in The Nature Conservancy, as part of the Fire Learning Network. Mary has enjoyed working with people and fire in collaborative land management, research and education since joining the Conservancy in 1986. Having worked in fire from the arctic to the tropics in the Western Hemisphere, and from coast to coast in the continental US, Mary's next conquest is learning more about fire in the Eastern Hemisphere. She asks, "What is your next learning adventure?"

"Building the Airplane while You're Flying It" - What today's fire planners say about their profession and the training they want.

As fire management in the US becomes increasingly complex, so does the work of people who are charged with developing plans for landscape-scale management, including restoration of fire-adapted ecosystems and on-site wildfire response. For fire management planners, this includes weaving together layers of ever-changing policy with sophisticated modeling applications and cross-boundary collaboration. Fire planners must master a variety of dissimilar competencies to be successful in this multi-dimensional environment; however, no formal training curriculum or learning pathway for fire manage-

ment planners exists. Amid this complexity, planners arrive at their positions through a variety of career paths including dispatch, GIS, fire operations and ecology. Adopting a single-tream, linear training curriculum is likely to be ineffective. To address the need for a state-of-the-art training approach for fire planners, the Interagency Fire Planning Committee of NWCG conducted a needs assessment in 2011. How do fire planners currently learn what they need to know to become proficient in their work? How they prefer to train, and what kinds of learning pathways would they find helpful for career development? Using focus groups and semi-structured interviews, we studied the responses of sixty participants from the five federal fire agencies. Participants included planners currently working in different geographies and levels of agency management (e.g., site level planners to agency fire directors). Qualitative analysis of interview transcripts revealed seven themes that are guiding the IFPC's current efforts to develop flexible, learning pathways for fire planners in conjunction with the Wildland Fire Institute of the National Wildfire Coordinating Group.

Jardel-Pelaez, Enrique   (Poster #40)

Enrique J. Jardel Pelaez, Profesor of Forest Ecology and Management, University of Guadalajara-CUCSUR, Mexico.He conducts research on landscape patterns and dynamics, disturbance regimes and ecological succession and has been working for almost 30 years in community based forest management, biological conservation and forest restoration in the Sierra de Manantlán Biosphere Reserve and other areas of Mexico. Is member of the executive comittee of the Mexican Long Term Ecological Research Network, the Mexican Council for Sustainable Silviculture and the National Council of Natural Protected Areas.

Potential fire regimes and fire management in Mexico

Knowledge and understanding of fire regimes is fundamental to design sound fire management practices. The high ecosystem diversity of Mexico offers a great challenge to characterize fire regimes. A conceptual model was developed considering the main factors controlling fire regimes at the landscape scale: climate and vegetation cover. We classified landscape units combining bioclimatic zones from the Holdridge life-zone system and actual vegetation cover. Since bioclimatic conditions control primary productivity and biomass accumulation (potential fuel), each landscape unit was considered as a fuel bed with a particular fire potential (fire intensity and behavior). Climate is also a determinant of post-fire recovery rates of fuel beds, and climate seasonality (length of the dry and wet seasons) influences fire probability (available fuel and ignition efficiency). These two factors influence potential fire frequency. Potential fire severity can be inferred from fire frequency, fire intensity and behavior, and vegetation composition and structure. Based in the conceptual model, an exhaustive literature review and expert opinion, we developed rules to assign a potential fire regime (PFR) defined by frequency, intensity and severity (i.e. fire regime) to each bioclimatic-vegetation landscape unit. Three groups and eight types of potential fire regimes were identified. In Group A are fire-prone ecosystems with frequent low severity surface fires in grasslands (PFR type I) or forests with long dry season (II) and infrequent high-severity fires in chaparral (III), wet temperate forests (IV, fire restricted by humidity), and dry temperate forests (V, fire restricted by fuel recovery rate). Group B includes fire-reluctant ecosystems with very infrequent or occasional mixed severity surface fires limited by moisture in tropical rain forests (VI) or fuel availability in seasonally dry tropical forests (VII). Group C and PFR VIII include fire-free environments that correspond to deserts. Application of PFR model to fire management is discussed.

Jenkins, Katelynn   (Poster #24)

Katelynn Jenkins is completing her Bachelor of Science degree in Forestry at Northern Arizona University (NAU) and is an Undergraduate Research Assistant for the Ecological Restoration Institute. In addition to her academic achievements, Katelynn is President of NAU's Student Chapter for the Society of American Foresters and an active member in Xi Sigma Pi Forestry Honor Society and the Student Association for Fire Ecology.   Michael Johnson is completing his Bachelor of Science degree in Forestry at NAU and is the Administrative Assistant and Forestry Technician for NAU's Centennial Forest. In addition to Michael's academic achievements, he is Forester (President) for Xi Sigma Pi Forestry Honor Society.

Aspen regeneration and stand dynamics on the Schultz Fire, Coconino National Forest, AZ

The June 2010 Schultz Fire north of Flagstaff, AZ, burned over 15,000 acres on the Coconino National Forest (CNF), including several quaking aspen (Populus tremuloides) stands. In an attempt to protect regeneration success of burned aspen stands within the Schultz Fire, CNF managers are implementing jackstraw treatments to limit ungulate movement through the regenerating aspen stands. Little is known about the success of jackstraw treatments on aspen regeneration, the long-term ecological effects, or ecological restoration implications. We have established permanent plots for future use by the Forest Service, Northern Arizona University (NAU) School of Forestry, and NAU Ecological Restoration Institute, to monitor stand dynamic and regeneration changes over time. In our study, we are measuring aspen regeneration, under-

story cover, overstory development, and downed woody debris decay pre- and post-treatment to determine if jackstrawing is a successful management tool for protecting aspen seedlings and suckers. We expect to see more understory productivity, fewer signs of elk and deer, and taller aspen regeneration in treated areas. The purpose of this project is to explore jackstrawing as a viable management option and lay the groundwork for future research in this arena. As a point of interest, we have observed multiple aspen seedlings growing alongside suckers which may assist aspen's ability to adapt to climate change and remain a functional component of northern Arizona forest ecosystems.   As of September 9th, 2012, our pre-treatment data is fully collected. The jackstraw treatments were completed in July by the Forest Service and throughout the next month we will revisit our plots to collect post-treatment data. Data compilation and analysis will be completed by mid-October and the poster will be ready for submission by mid-November.

Johnson, Michael   (Poster #53)

Michael Johnson, Fire Geospatial Analysis and Ecology Intern, US Fish and Widlife Service/Student Conservation Association (SCA).   Michael is the author of the Fire Atlas Development document. The document provides guidance on how to create a fire atlas for other National Wildlife Refuges in the US Fish and Wildlife Service. This is part of a nationwide effort to capture the location and extent of past fires on refuge lands dating back to 1984.

Fire Atlas Development - US Fish and Wildlife Service Southwest Region

The Fire Atlas project records past fire occurrence on and near National Wildlife Refuge lands dating back to 1984. Fire perimeters are mapped for all fires on record greater than or equal to 10 acres. The fire atlas for a refuge is given to the Fire Management staff responsible for managing wildfires and prescribed fires in the area. The information may be used to aid in planning and monitoring prescribed fires as well as making tactical decisions for suppressing or managing wildfires. The information may also be made available for researchers and other interested parties.   The Fire Atlas Development document outlines the steps to create a fire atlas using Landsat satellite imagery, ArcGIS, and ERDAS Imagine software. This poster highlights parts of the Fire Atlas Development document and shows some examples from the Texas Mid-Coast Refuge Complex fire atlas.

Johnson, Morris   (Poster #78)

Morris C. Johnson is a Research Fire Ecologist with the Pacific Northwest Research Station, Pacific Wildland Fire Sciences Laboratory located in Seattle, Washington. He began his Forest Service career as a Forest Ecologist CO-OP student on the Prospect Ranger District, Rogue River National Forest in 1994. He was a member of the 1999 Redmond Interagency Hotshot crew (Redmond, Oregon) and 2001 Redding Interagency Hotshot crew. In 2002, he joined the Pacific Wildland Fire Science Laboratory as a Fire Ecologist. Morris Johnson received his B.S. in Urban Forestry from Southern University, Baton Rouge, Louisiana in 1996; M.S. in Silviculture and Forest Protection from the University of Washington; 2002, and Ph.D. in Forest Ecosystem Analysis from the University of Washington in 2008.

Linking the Forest Vegetation Simulator and the Fuel Characteristic Classification System to improve fuel quantification and fire behavior predictions

To evaluate fuel treatment efficacy on fire behavior at multiple spatial scales, fuel and fire managers depend on fire decision-support tools with inherent limitations and assumptions. Current tools do not compute fire behavior with real fuels data, but instead use stylized fuel models as substitutes to characterize and quantify the structural complexity and variability of wildland fuels found across diverse forest and nonforest ecosystems in the United States. We developed a Forest Vegetation Simulator (FVS) post-processor as an alternative decision-support tool that incorporates the best available science to assess fire hazard and fire behavior at multiple spatial scales.

Karau, Eva   (Poster #89)

Eva Karau is a biological scientist with the Fire Modeling Institute at the Forest Service Rocky Mountain Research Station, Fire Sciences Laboratory. She has B.S.in Geology from the University of Montana and an M.S. in Forestry from the University of Montana. Her work involves spatial analysis for a system that helps to inform hazardous fuels prioritization and allocation decisions on a national scale. Before joining FMI, Eva was an ecologist in the Fire Fuels and Smoke program, where she evaluated burn severity mapping techniques and used succession and disturbance simulation models to explore landscape ecology questions and assess the ecological benefits of wildfire.

Hazardous Fuels Prioritization and Allocation System

The Hazardous Fuels Prioritization and Allocation System assists the Forest Service (FS) Washington Office Fire and Aviation (WO-FAM) staff by helping inform the distribution of hazardous fuels funding among FS Regions. Members of the Fire Modeling Institute, FS WO FAM and the FS Pacific Northwest Research Station collaborate each fiscal year to complete the analysis at national and regional scales. The decision process takes into consideration the following factors: wildland fire potential, population density, smoke emissions, water supply, and performance measures. These data elements are compiled at a national spatial extent for input into the Ecosystem Management Decision Support (EMDS 4.2) system which incorporates a logic model (Netweaver) and a decision model (Criterium Decision Plus). EMDS assigns priority scores to each region based on the importance assigned to the data elements by an expert panel. Data and models are now available to regional level managers who wish to use it to help inform fuels funding allocation within individual regions.

Kertis, Jane   (Poster #67)

Jane A. Kertis, Ecologist, Northwest Oregon Ecology Program (USFS) Ecologist working in fire ecology in western forests for over 20 years. She has tracked post-fire conditions in the Charlton and Warner Creek fires for over 15 years.

Tree recruitment following wildfire in a mountain hemlock forest, Oregon Cascades

Wildfire is the predominant large-scale disturbance of mountain hemlock forests in the Pacific Northwest; fires tend to be infrequent and of high severity. We studied recruitment of tree seedlings (stems < 1.37 m tall) and saplings (>= 1.37 m tall and < 5 cm dbh) in 12 0.1 ha plots for 15 years following the 1996 Charlton wildfire in the Cascade Range of Oregon, comparing unburned areas to areas with varying fire severity. We sampled three plots in unburned areas and each of three fire severity levels: high mortality (<10% surviving trees)--tree crowns consumed by fire, high mortality--crowns scorched by fire, and partial mortality (>10% and <90% surviving trees). We also tracked numbers of live and dead trees (stems >=5 cm dbh, including survivors and post-fire recruits), downed wood and seedbed conditions. One year after fire, live trees were absent for high mortality--crowns consumed and sparse for high mortality--crowns scorched (0 to 50/ha), variable for partial mortality (50 to 830/ha) and abundant on unburned plots (320 to 2050/ha). Two years after fire, seedlings were sparse where there was high mortality (0 to 500/ha for crowns consumed and 700 to 1600/ha for crowns scorched) com-pared to partial- mortality (> 1900/ha) and unburned (>3500/ha). However, fifteen years after the fire, neither seedling density (overall median 5100/ha) nor sapling density (overall median 70/ha) were statistically distinguishable between fire severity levels. After 15 years, live trees were sparse on high-mortality plots (0 to 10/ha for crowns consumed, 0 to 50/ha for crowns scorched), variable for partial mortality (40 to 850/ha) and abundant on unburned plots (290 to 2040/ha). Though recruitment of seedlings was abundant at all levels of fire severity 15 years after the fire, there has been little recruitment of saplings or trees.

Kinney, Kealohanuiopuna   (Poster #50)

Kealohanuiouna M Kinney PhD Student, Department of Geographical Sciences, University of Maryland at College Park Department of Geographical Sciences, University of Maryland, 2181 LeFrak Hall, College Park , MD, 20742   My overarch-ing interests are in understanding how land use, climate change, and natural disturbances affect the structure, composition and functioning of ecosystems, and how these changes alter services provided by ecosystems to human societies. I am par-ticularly interested in using records from fossilized wood and macroscopic charcoal, plant microfossils, and stable isotopes to improve our understanding of interactions between natural and anthropogenic fire, climate, and vegetation during the previous ten thousand years within dry-land ecosystems on the Island of Hawaii.

Fire regime facilitates unexpected nutrient limitation in Hawaiian subalpine dry forest?

We used measurements from airborne imaging spectroscopy and LiDAR to quantify the structure and composition of vegetation on a dryland substrate age gradient in Hawaii. We excavated soil pits on Pleistocene-aged substrates to search for macroscopic charcoal as an indicator of prehistoric fire. We did this to determine whether ecosystem retrogression was prevalent in subalpine drylands, and whether the replacement of dry forests by grasslands was associated with a his-tory of fire. The structure and composition of vegetation changed during primary succession. Tall-stature Metrosideros polymorpha woodlands dominated on the youngest substrates, and were replaced by the tall-stature endemic tree species Myoporum sandwicense and Sophora chrysophylla on intermediate-aged flows. The oldest substrates were dominated by the short-stature native shrub Dodonaea viscosa and endemic grass Eragrostis atropioides. We excavated 18 macroscopic charcoal fragments. Mean radiocarbon age was 2002 and ranged from < 200 to 7,730years BP. Genus identities from four fragments indicate that Osteomeles spp. or M. polymorpha once occupied the Pleistocene-aged substrates, but neither of these species is found there today. These findings indicate that retrogressive patterns are prevalent on substrates long before P-limitation is known to occur, and that fires in this system unambiguously predate the arrival of Polynesians in the

Hawaiian Islands. This raises the possibility that these systems may be responses to both recent anthropogenic fires and the deeply embedded volcanic history of the landscape. These findings provide a framework for understanding contemporary ecosystem dynamics and inform adaptive management in Hawaiian dryland ecosystems.

Kitchen, Stanley   (Poster #59)

Stanley Kitchen is a Research Botanist at the USDA Forest Service, Rocky Mountain Research Station. Dr. Kitchen's research focuses on the drivers of fire regime variability and consequences of fire regime change in forest, woodland and shrubland ecosystems of the Great Basin and Colorado Plateau of western North America.

Historic Quaking Aspen Fire Regimes in Utah (USA) Forests

Quaking aspen (Populus tremuloides) is the most widely distributed tree species in North America. In the Intermountain West, aspen occurs across a broad range in elevation and is found in relatively pure stands and in association with various conifer species. Reproduction is primarily asexual (root suckering) resulting in long-lived, spatially-stable clones that benefit from periodic disturbance. Our objective was to characterize historic aspen fire regimes in Utah, a state with abundant aspen across a broad range of forest types. We extracted fire-scar and tree-recruitment data for 122 plots (aspen present) from 11 sites in which plot grids were designed to span a broad range in elevation and vegetation type (299 total plots). Aspen plot elevation ranged from 2340 to 3204 m for southern sites and from 2255 to 3172 m for northern sites. Based upon pre-Euro-American (1860) reconstructions, the proportions of plots that were aspen (≥ 50 percent stem density) versus conifer-dominated were approximately equal across all sites. Plot evidence of non-lethal, surface fires in the form of annually-dated fire scars (on conifers) was sufficient to estimate mean fire intervals for 19 plots. Estimates ranged from 7 to 109 years with a mean of 32.4 years (1650-1900). We inferred fire severity using criteria that took into account the presence (or absence) of fire scars and recruitment cohorts and tree mortality patterns. Plots were classified as 10 percent low-, 25 percent mixed- and 20 percent high-severity, with 45 percent unclassified. Results suggest that historically, aspen in Utah persisted in both aspen- and conifer-dominated stands, the composition and dynamics of which varied in response to temporal and spatial variation in fire regime parameters.

Kline, Tim   (Poster #109)

Tim Kline has been the coordinator of the California Fire Science Consortium since the organization was funded in March 2011. In addition to his fire science outreach work, Tim likes to make wooden spoons and climb.

California Fire Science Consortium - Poster

The California Fire Science Consortium (CFSC) is part of a national coalition of regional consortia established by the Joint Fire Science Program to facilitate awareness, understanding, and integration of wildland fire science information between researchers and federal, state, tribal, local, and private land managers and stakeholders. As a network of scientists, managers, and outreach experts across the state, the CFSC seeks to ease communication and collaboration across the state's many agencies, universities, governments, tribes, and citizens.

Kooistra, Chad   (Poster #20)

Chad earned his B.S. in Natural Resource Recreation and Tourism from Colorado State University in 2005, and his M.S. in Natural Resources from the Conservation Social Sciences (CSS) Department at the University of Idaho in 2011. Currently working towards his PhD in the CSS Department, his research is part of an interdisciplinary NASA sponsored project aimed at better understanding the socio-ecological characteristics of 'extreme' wildfires and what it means for fostering more resilient social and natural communities. His first publication was with Dr. Gary Machlis in the Journal of the Office of Strategic Services (OSS) Society writing about how applying science during crises can be inspired by the work of the OSS intelligence agency during WWII.

Understanding landscape change and recovery chronosequences after wildfires: A proposed interdisciplinary approach

We describe proposed research to triangulate different types of data related to landscape recovery trajectories after wildfire events. Peoples' health and well-being are often impacted by the surrounding landscape, and perceptions of landscape change can affect support for forest and rangeland management. However, research integrating biophysical and social components of landscape change is limited. Considering the dynamic nature of the earth and climate systems and the increasing potential for widespread forest disturbances, it is important to understand the implications of landscape changes, and perceptions of changes, on managing dynamic landscapes. Our research will focus on viewsheds near communities

affected by wildfires within the past decade, particularly where different viewsheds exhibit different levels of recovery after a wildfire event. Remote sensing data (LandSat) will be used to assess pre-and post-wildfire vegetation biomass and cover. Degree of recovery will be assigned to portions of the viewsheds based on the remotely sensed images by comparing pre-fire vegetation conditions to post-fire conditions. Field data will be collected to validate conclusions drawn from the imagery. Vegetation sampling will measure post-fire vegetation biomass, cover, and diversity at several sites where we have pre-fire vegetation data. Social science research, using questionnaires and semi-structured interviews, will present respondents with maps of prominent viewsheds in the area featuring varying degrees of post-fire recovery to solicit perceptions of landscape recovery. The social science will examine what factors influence perceptions of landscape recovery and the implications for forest and rangeland management on public and private land. The three data sets will create a unique understanding of recovery chronosequences integrating social and biophysical data for wildfire events of different levels of severity. This research will add a temporal understanding to the relationship between biophysical attributes of a landscape after a disturbance over time and residents' sense of place.

Kremens, Robert   (Poster #39)

Robert L Kremens, Research Professor, Rochester Institute of Technology I am a physicist by training who is now studying combustion and basic physical phenomena of wildland fires. I have developed in-fire and airborne instrumentation to observe the radiant and convective energy release from fires. Equipment I have developed is used in collaborative efforts with the USFS Rocky Mountain, Northern and Southern research stations and with several universities. I published a review paper in 2010 in AFE Fire Ecology on the challenges of measuring radiant heat release from wildland fires..

Estimation of the total radiant heat release from a wildland fire using temporally undersampled airborne infrared observations

Observing the total radiant energy from a wildland fire is difficult because of the large spatial and short temporal scales involved. Wildland fire covers large areas and moves over the landscape relatively quickly.   Practical limitations limit high time resolution in-fire sampling to a few points (<20) within the fire. These observation points may not be representative of the fire because of the high spatial variability of most wildland fires. Satellite or airborne observations can spatially sample the entire fire ground, but these observations are limited temporally because of return time limitations of satellites (>¼ day) and aircraft (~5 minutes). We have developed a method to use temporally undersampled time-sequence airborne data to measure the average total radiant energy from wildland fires. This method involves selecting pixels that have complete temporal histories (cold ground to cold ground), time integrating and averaging the radiant output from these pixels, and then applying this average value over the entire fire ground for any pixel that was hot at some point during the fire. We capture 40 to 60 frames during the course of the fire. Temporal interpolation of the data is not required because the 1/e cooling time of the soil has shown to be on the order of 3-5 minutes which matches our observational sampling period. We will show examples of this method using ground-truth calibrated airborne long wave infrared data collected using the Rochester Institute of Technology WASP sensor system.

Kreye, Jesse   (Poster #48)

Jesse Kreye is a Postdoctoral Research Associate in the Department of Forestry at Mississippi State University. He recently completed his PhD at the University of Florida in the School of Forest Resources and Conservation.

Towards a mechanism for eastern deciduous forest mesophication: the role of litter drying

Long-term fire exclusion has altered ecological functions in many ecosystems in North America.   The invasion of fire-sensitive tree species into pyrogenic upland forests in the southeastern USA has resulted in shifts in fuelbeds and reductions in ecosystem pyrogenicity. Enhanced moisture retention in surface fuels would result in lower probabilities of ignition and fewer opportunities for burning, thus enhancing conditions for fire-sensitive mesophytic species to invade and persist. In order to evaluate a potential mechanism of the mesophication of these forests, we quantified the moisture retention (response time and initial moisture capacity) of foliar litter beds from 17 southeastern tree species. Analyses revealed four clusters: a rapidly drying cluster of eight species; a five species group that absorbed little water, but also lost it slowly; a two species group that absorbed substantial moisture and lost it rapidly; and a two species cluster that absorbed substantial moisture and also dried slowly. Fire-sensitive species fell in the slow moisture loss clusters while fire-resistant species tended to cluster in the rapid drying groups. Principle Components Analysis indicated that several leaf characteristics correlated with absorption capacity and drying rates. Thin-leaved species with high surface area:volume had the greatest moisture content, while those with large, curling leaves had the fastest drying rates. The dramatic shifts in litter fuels as a result of invasion by fire-sensitive species generates the positive feedback that eliminates pyrogenic species in the uplands of the southeastern US.

Krezek-Hanes, Chelene (Poster #82)

Chelene Krezek-Hanes is a physical scientist with the fire and climate change group at the Great Lakes Forestry Centre, a laboratory of Natural Resources Canada. She conducts studies in fire behaviour using spatial analysis tools including remote sensing and geographic information systems.

Improving the Canadian Forest Fire Danger Rating System Fuel Moisture Codes with RADARSAT-2 data

Each year in Canada, approximately 18,500 km2 of forests are burned by wildfires. This number can escalate to as high as 75,000 km2 in an extreme fire year. The prediction of when and where these fires will occur is extremely important, especially with the expansion of the urban wildland interface into more remote areas and predictions of greater fire potential with climate change. The current fire danger rating system has had proven success operationally in Canada. Despite its proven utility efforts to improve upon the Canadian Forest Fire Danger Rating System (CFFDRS) over time are required, especially with new technology. Currently, the fuel moisture codes within the CFFDRS are calculated using point source meteorological data. Studies in Alaska and the North West Territories, using Synthetic Aperture Radar (SAR) remote sensing have established relationships between SAR backscatter and the fuel moisture codes, initiating the possibility of predicting the codes spatially. Of particular interest is the prediction of the spring start-up values for the Drought Code (DC). The DC is the memory of pre-fire season conditions, requiring a spring adjustment dependent on winter precipitation totals. The methods of adjustment vary across the country and rely heavily on local knowledge and educated estimates. A scientifically rigorous adjustment to the DC based on remote sensing would be of great benefit. To achieve this goal we have been expanding on the previous SAR, fuel moisture code work using jack pine forests, in north central Ontario. This has been done using advances with polarimetric SAR data and field based duff moisture measurements from 2010 to 2012. Relationships have been established between polarimetric indices and the fuel moisture codes of the CFFDRS.

Kropp, Rachael (Poster #61)

Rachael Kropp is currently a Conservation Intern through the Student Conservation Association at the Missoula Fire Sciences Laboratory. She recently graduated from the University of Minnesota, Twin Cities, receiving an undergraduate degree in Environmental Sciences, Policy, and Management and a minor Chemistry.

Monitoring Seasonal Variation of Foliar Heat Content in Big Sagebrush

Seasonal variation of foliar heat content of Big Sagebrush (Artemisia tridenta) was studied at two sites near Missoula, Montana between the months of July and September 2012. Foliar samples were randomly chosen from the terminal tips of new shoots once per week throughout the study period. Samples were oven dried and their heat content was determined using an IKA 200 Oxygen Bomb Calorimeter. Additionally, their foliar moisture content and crude fat were also determined in the laboratory. Heat content did not vary significantly by location, but did vary seasonally. Foliar heat content increased 3MJ/kg over the study period from a low around 18 MJ/kg in early July to a high of 21 MJ/kg in late September. These changes occurred concurrently with decreases in their foliar moisture content and increases in their crude fat content. These results suggest sagebrush have a higher potential heat yield when new foliage has completely matured. This information will aide in the refinement of fire behavior predictions for sagebrush throughout the Interior Western United States.

Labosier, Christopher (Poster #3)

Chris Labosier PhD Candidate Department of Geography Texas A&M University   Chris is working on his dissertation in southeastern wildfire climatology. His interests include hydroclimatology, applied climatology, and links between ecosystem processes and climate. In the spring of 2012, he was awarded 1st place in the Climate Specialty Group paper competition at the Annual Meeting of the Association of American Geographers.

Relationships between Spatial Patterns of Precipitation and Wildfire Occurrence in the Southeastern United States

Wildfire plays a critical role in some ecosystems and a variety of factors influence the spatial patterns of wildfire across landscapes. This preliminary study examines how the hydroclimatology of the southeast United States influences spatial patterns of wildfire. Because the southeast is a humid climate, it is hypothesized that drier locations and locations with more variable precipitation regimes will be more prone to wildfire activity in the region. Station data from the National Climatic Data Center (NCDC) are used to characterize precipitation regimes within national forests. Mean daily precipitation and daily coefficient of variation (CV) are calculated for each national forest in order to examine both mean conditions and variability. Wildfire occurrence data for each of the 26 national forests is obtained from the National Interagency Fire Management Integrated Database (NIFMID). Mean annual wildfire density (fires/400,000 ha/year) and mean annual area burned (area burned/400,000 ha/year) are calculated and analyzed alongside both mean daily precipitation and the

CV of daily precipitation for each national forest. Results suggest that both mean daily precipitation and daily precipitation variability influence spatial patterns of fire activity in the region. Station data is potentially limiting when characterizing precipitation regimes in higher elevations as many stations are located at lower elevations and therefore may not accurately represent precipitation throughout an entire national forest. Furthermore, there are a variety of factors beyond precipitation that influence wildfire occurrence, including topography, vegetation, proximity to human settlement, and fire management policies. Consequently, future research will entail the use of gridded precipitation data that takes into account elevation and fire danger ratings that are less influenced by the factors previously mentioned.

Lahm, Pete   (Poster #103)

Pete Lahm is the Air Resource Specialist for the USDA Forest Service, Fire and Aviation Management, in Washington, DC. Starting in 2004, Pete has led the Forest Service's smoke management efforts developing technical approaches and policies related to smoke impacts from prescribed fire and wildfire. Since 2009 he has chaired the National Wildfire Coordinating Group's Smoke Committee. Prior to 2004, Pete managed the Arizona Interagency Air Resource and Smoke Management Program. He chaired the Western Regional Air Partnership's Fire Emissions Joint Forum from 1996-2004 where numerous national and regional scale smoke management policies and technical approaches were developed. Pete also owns a small business consulting in automotive rally racing and holds a Master's of Environmental Management from Duke University.

Linking Visual Range, PM2.5 Concentrations, and the Air Quality Index - What do we tell the PUblic in Smoke-Filled Wildfire Situations?

Many states are investigating or already implementing a methodology developed in the arid intermountain west where concentrations of particulate matter with aerodynamic diameter less than or equal to 2.5 micrometers (PM2.5) are estimated from an observed visual range (VR) measurement. The PM2.5 concentration estimate is then linked to the EPA public health warning scale called the air quality index (AQI) to inform the public about potential health impacts from smoke from wildfire. Important caveats are: 1) the method only applies when relative humidity (RH) < 65%, and 2) the atmosphere must be predominantly impacted by smoke (i.e. low concentrations of PM2.5 from other anthropogenic sources). In this work, the Interagency Monitoring of PROtected Visual Environments (IMPROVE) light extinction equation was applied to investigate the correlation of VR and PM2.5 as an atmosphere becomes more smoky. This was done for various parts of the country where background anthropogenic concentrations can be more significant than in the arid inter-mountain west and where RH can typically exceed 65%. Results show that for regions where RH > 70% and non-negligible background anthropogenic concentrations exist, this VR/PM2.5/AQI methodology developed in the arid inter-mountain west may not apply. A national health-based air quality standard does not exist for short-term PM2.5 impacts, but the Environmental Protection Agency (EPA) has included this VR/PM2.5/AQI methodology in its Wildfire Smoke, A Guide for Public Health Officials and Canada has also developed a multi-pollutant (PM2.5, ozone, NO2) 3-hr based air quality health index (AQHI). The various state, EPA and international approaches to informing the public about potential health impacts from wildfire smoke will be presented along with the technical analysis of PM2.5 and VR based on the IMPROVE light extinction equation.

Lapham, Kyle   (Poster #99)

Kyle Lapham Loess Hills Fire Coordinator The Nature Conservancy - Iowa Being able to bring people together from every side of the fence to advance the use of fire globally.

Neighbors Helping Neighbors: Fire Training Exchanges Spread Like Wildfire

"Through the Fire Learning Network (FLN)—a project of The Nature Conservancy, US Forest Service and Department of the Interior agencies—partners have worked together to develop strategies to scale up the use of fire for over 10 years. One such strategy has been the development of an innovative live-fire, experiential learning program called prescribed fire training exchanges (TREX). Originating in the Great Plains, where most land is privately owned and firefighting capacity is limited, we have built upon the age-old ethos of neighbors helping neighbors. We have expanded the concept to include not only a rancher in Nebraska helping a neighbor across the fence, but also neighbors as far-flung as the US Forest Service in California or the Ministry of the Environment in Spain, working together to-advance the use of fire globally.

Lee, Kristine   (Poster #98)

Kristine M. Lee is the Director of the Fire Modeling Institute and the Deputy Program Manager for the Fire, Fuel, and Smoke Science Program with the Fire Research Laboratory, U.S Forest Service, Rocky Mountain Research Station. She has been with the U.S. Forest Service for over 20 years, working on both the research and management sides of the agency.

The Fire Modeling Institute: a Success Story in the Integration of Fire Science into Management

The Fire Modeling Institute (FMI) brings the best available fire and fuel science and technology developed throughout the research community to bear in fire-related management issues across the nation. Because of the increasing number and complexity of wildland fire computer tools and the large, growing body of fire research, land managers are challenged to stay current with the skills and knowledge needed for resource management. The three branches of FMI - Application Team, Information Team, and Modeling Team - provide different roles and assistance to managers and scientists in the application of fire science, including physical fire processes, fuel dynamics, smoke emissions & dispersion, fire ecology, and fire & fuels management strategies. Working with management one-on-one or with teams, provides FMI staff and fire scientists the opportunity to learn from the management community as much as managers learn from FMI analysts and interactions with research scientists. FMI is a national resource that provides a fundamental role in integrating science and management in the application of the latest technology and information to address fire management issues.

Leis, Sherry (Poster #108)

Sherry A Leis is the Coordinator for the Great Plains Fire Science Exchange and a Fire Ecologist for the Heartland Inventory and Monitoring Network of the National Park Service. She has been working on fire and grassland ecology information needs for ten years. She was recently awarded the Outstanding Young Professional Award from the Society for Range Management for her work.

Great Plains Fire Science Exchange

Although fire plays and important role in maintaining ecosystems in the Great Plains, managers, fire operations, private landowners, and researchers working with fire are often disconnected. We are developing a Great Plains Fire Science Exchange Consortium that will join a nationwide network of regional consortia funded by Joint Fire Science Program (JFSP). The knowledge exchange vision is to build collaborative science delivery networks to accelerate the awareness, understanding, and adoption of wildland fire science information. The approach will be to improve communication between researchers, managers, and private landowners. The Great Plains Fire Science Exchange is focused on mid-continent grassland resources with a long evolutionary history of grazing including both working landscapes and conservation lands in both public and private ownership. The Exchange plans to increase the availability and application of fire science information for natural resource management and to serve as a conduit for fire managers to share research needs with the research community. Consortium products will be developed using feedback and suggestions directly from the Great Plains fire community. We plan to achieve a more cohesive community of fire users by providing a web based clearinghouse for information, developing a network of demonstration sites, and a variety of research synthesis products.

Livingston, Amy (Poster #64)

Amy Livingston is a Master's candidate in the Forestry and Wildland Resources Department at Humboldt State University. Her research interests include: invasive species effects on fire regimes, and understanding the effects of conifer encroachment on understory plant diversity in fire-dependent Oregon white oak woodlands in Northern California. Her adviser is Dr. J. M. Varner of Mississippi State University.

Fuel moisture differences in a California mixed native/ non-native grassland: Implications for fire regimes

Non-native invasion can have a broad array of effects on disturbance regimes. In fire-prone grasslands, one consequence of non-native grass invasion is alteration of fuelbed characteristics that determine ignition, intensity, and spread rates of surface fires. To better understand this phenomenon in California grasslands, we sampled fuel moisture content and stature of grasses in the Bald Hills of Redwood National Park. We sampled fuel moisture and plant stature of four native and four non-native grasses monthly during the 2012 fire season. Moisture contents were compared between native and non-native groupings, among species, and across collection periods using Welch two sample t-test and ANOVA. Mean moisture content for native and non-native grasses was significantly different across the sampling period (P <0.01). Species also differed (P< 0.001) across all sampling months. Harding grass, Phalaris aquatica, an aggressive invasive, had the highest mean moisture content for all months, while California fescue, Festuca californica, a prominent native bunchgrass, had the lowest mean moisture content. Harding grass moisture contents were significantly higher than all the native grasses across all fire season sampling dates (P<0.001). Among species, the prevalent non-native Cynosurus echinatus was the first species to dry below moisture of extinction (06 August). Our results suggest that some non-natives function to increase fire hazard (e.g. Cynosurus echinatus) while others may abbreviate the fire season (Phalaris aquatica). The degree to which non-natives affect fire behavior depends on the density and extent of their occurrence. Our results underscore the importance of understanding the potential effects of non-native species on contemporary fire regimes.

Llamas-Casillas, Paulina   (Poster #9)

I'm a graduate student from the University of Guadalajara, I have 7 years working in forest ecology applied to management. I won a award from the Botany Society of México for my research about stand-repleacement fire in western México and I'm a coautor in a publication about fire research priorities in México.

Fire Regime in pine-oak and mixed conifer-hardwood forests of The Sierra de Manantlán in Western México.

Climate, geomorphology and vegetation are main factors controlling the variation in fire regimes at landscape-scale. In the Sierra de Manantlán Biosphere Reserve (west-central México, 19°35' northern latitude), we compared the fire history of four sites located in two landscape conditions (1) pine-oak forests in mountain ridges and upper slopes and (2) mixed conifer-hardwood forests in depressions and ravines, and two bioclimatic zones (1) warm temperate (1950-2200 masl) and cool temperate (2700-2800 masl). We obtained 118 cross-sections of live trees and stumps from conifer species (Pinus douglasiana, P. pseudostrobus, P. durangensis, Abies guatemalensis and A. religiosa). After developing a master chronology of 207 year length (1804-2010), fire scares were cross-dated and mean fire intervals (MFI) calculated from the first to the last recorded fire in each site. The MFI was shorter in the pine-oak forest of mountain ridges and slopes of the warm temperate zone (3.6 years) than in the cool temperate zone (6.3 years). In the mixed conifer-hardwood forest the MFI was longer in the warm temperate zone (28 years) in relation to the cool temperate zone (16.5 years). These results agree with previous studies in the area in which, from characterization of climate, geomorphology and fuel beds, it has been inferred that pine-oak forests have a potential frequent low severity surface fire regime, while the mixed conifer-hardwood forests is characterized by a relatively infrequent mixed severity fire regime. Changes in land use and forest management have influenced fire regimes. The results are being applied in designing fire management practices in the biosphere reserve.

Logan, Dustin   (Poster #4)

Dustin Logan is a MS graduate student at Oklahoma State University in the Natural Resource Ecology and Management Department studying forest resources. He received his B.S. degree in Biological Science with a minor in Chemistry from Bowling Green State University in December 2009. His current research interests are the effects of prescribed fire on soil carbon.

Prescribed burning effects on soil carbon in upland oak forests

Carbon sequestration has become a major concern in recent years due to elevated carbon dioxide in the atmosphere that has a potential to affect global climate. Fully understanding how to reconcile use of prescribed fire to control invasive species and maintain historical stand structures with the potentially negative effects of fire on carbon storage will be important for land managers concerned with carbon sequestration. Forest management often includes a prescribed fire program and the effects of fire on carbon storage are important to know in order to create the optimal system. We studied effects of low intensity prescribed fire on soil carbon (C) and nitrogen (N) in upland oak forests in three wildlife management areas (WMA) in Oklahoma. Prescribed fire treatments ranged from 0–5 fires per decade and 1–25 years since last fire. Soil samples were collected from 0–5 cm and 5–20 cm from 15 plots within 5 treatments per WMA. In addition, litter was collected from a 0.5 x 0.5 m quadrat. All litter and soil samples were ground, homogenized and analyzed for total C and N and litter samples were analyzed for lignin content. Soil N and C at 0–5cm were 0.07–0.34% and 1.17–4.62%, respectively. Soil N and C at 5-20cm were 0.03–0.18% and 0.35–2.32%, respectively. Prescribed fire had a significant effect on soil C and N at 0–5cm at all three WMAs and 5–20cm at two WMAs. Preliminary analyses showed soil C and N were greatest at intermediate fire frequencies. These results suggest both fire suppression and too frequent prescribed burning may reduce soil carbon in upland oak forests.

Long, Alan   (Poster #83)

Alan Long is Professor Emeritus with the School of Forest Resources and Conservation, University of Florida. His teaching, extension and research activities focused on fire ecology and management, forest operations, forest stewardship and management opportunities for nonindustrial private forest landowners, and continuing education for professionals. He currently works with Tall Timbers Research Station as Administrative Director of the Southern Fire Exchange, a Joint Fire Science Program regional consortium for fire science technology transfer. Over the last 10 years, Alan has focused both research and outreach on WUI fire hazard assessments and issues. He received the AFE Herbert Stoddard Sr Lifetime Achievement Award in 2008.

Southern Fire Exchange: Putting Fire Science on the Ground

The Southern Fire Exchange (SFE) is a regional program for fire science delivery, funded by the Joint Fire Science Program (JFSP) as part of the national knowledge exchange network. The SFE is directed by a partnership of the University of Florida, North Carolina State University, Tall Timbers Research Station, and the USFS Southern Research Station. The SFE covers the southern pine ecosystems across eleven states and places a heavy emphasis on prescribed fire. Consortium activities focus on four programmatic areas: 1) a 'first-stop' web-based Resource Center (www.southernfirescience. org) that consolidates southern fire information and links to a wide variety of additional resources; 2) technology transfer through the Fire Lines newsletter, fact sheets, research summaries and presentations; 3) direct communication between scientists and fire managers through webinars, workshops and research highlights at Prescribed Fire Council meetings; and 4) fact sheets about prescribed burning and wildfire that can be used to enhance public education. All our programs rely on a wide variety of partners who assist with program delivery and SFE governance. Details about each of these program components will be presented in the poster.

Long, Jonathan   (Poster #96)

Jonathan Long is an ecologist with the Fire and Fuels Program of the USDA Forest Service Pacific Southwest Research Station in Davis, California. He coordinates several research integration projects to help land managers address important challenges in ecological restoration of forest and wetland ecosystems. He has published articles and book chapters on projects to monitor and treat wetlands damaged by wildfires undertaken through a seventeen-year collaborative relationship with the White Mountain Apache Tribe and members of the community of Cibecue in Arizona.

Synthesizing science to promote long-term socio-ecological resilience in the Sierra Nevada Bioregion

The Pacific Southwest Research Station has led an innovative one-year effort to synthesize and distill recent scientific research to guide revision of land and resource management plans on the National Forests of the Sierra Nevada. Through a collaborative, transdisciplinary effort, the science team is producing an integrated report on strategies to promote long-term socio-ecological resilience in the Sierra Nevada Bioregion in the face of climate change, increases in wildfire severity and extent, demographic changes, and other expected stressors. The synthesis was developed to serve the National Forests of the bioregion in response to a request from the Region 5 planning staff and keen interest from stakeholders in the environmental community and forest products industry. The report expands upon recent PSW station reports by considering more social and economic values as well as a broader range of forest and aquatic ecosystems in the Sierra Nevada. In addition to a general lack of research that integrates socio-ecological issues, there is a mismatch between the long-term, landscape scale of management challenges in the region and the relatively short-term and small spatial scales addressed by much existing ecological research. One of the strategies developed in the synthesis builds upon the approach of fireshed modeling and other modeling efforts by considering how to analyze landscape conditions and design treatments that reduce the extent of undesirably severe wildfire, avoid impacts to sensitive species, consider opportunities to promote resilience of local communities, and incorporate adaptive management to evaluate outcomes. Other fire-related topics discussed in the synthesis include treatments to promote heterogeneity in forest structure, fuels, and post-fire conditions; treatments to emulate traditional indigenous burning practices; and the research gap concerning long-term post-fire outcomes and restoration strategies.

Meyer, Marc   (Poster #51)

Marc is an ecologist with the USDA Forest Service Pacific Southwest Region and serves the Sierra, Inyo, and Sequoia National Forests and Giant Sequoia National Monument. His work focuses on integrating science information into land management decisions for the national forests of the southern Sierra Nevada. Marc has a Ph.D. in ecology from the University of California Davis and has nearly 20 years of experience studying the effects of fire and fuel management treatments on California's flora and fauna. He is currently an Associate Editor for the journal Fire Ecology.

Post-fire vegetation change in singleleaf pinyon pine woodlands of the eastern Sierra Nevada

There is a critical need to understand post-fire vegetation changes in the eastern Sierra Nevada, where recent increased wildfire activity and cheatgrass (Bromus tectorum) invasions are impacting post-fire vegetation recovery in arid woodlands and shrublands. Our objective was to examine patterns of vegetation recovery nine years following the 1030-ha Birch Fire (2002) in singleleaf pinyon pine (Pinus monophylla) stands of the Inyo National Forest. We sampled a total of 39 regeneration plots (30 burned, 9 unburned) and 10 stand exam plots (8 burned, 2 unburned). Approximately 97% of burned plots burned at high severity. Live singleleaf pinyon pine basal area and overstory cover were significantly lower in burned plots (mean = 0.5% cover) compared to unburned controls (32% cover). Singleleaf pinyon pine regeneration was more than two orders of magnitude greater in unburned than burned plots, and regeneration was positively related to live pinyon pine

basal area. Species richness of shrubs was greater and shrub cover was marginally greater in burned than unburned plots. Cover of native herbaceous plants was 6.4 times greater in burned than unburned plots, although species composition was similar between sites. Cheatgrass cover was 38 times greater in burned plots. Cheatgrass was absent or in trace coverage (≤0.1%) in 89% of unburned plots, but 50% of burned plots had >25% cheatgrass cover. Cheatgrass cover was negatively related with native herbaceous plant cover, shrub cover, and live basal area of pinyon pine. Plots exceeding 20% cheatgrass cover tended to occur in the mid to upper topographic position of slopes. Our results are consistent with previous studies in the Interior West documenting high pinyon pine mortality, virtual absence of pinyon pine regeneration, increases in understory cover and diversity, and cheatgrass invasion following wildfire.

Miller, Kristen   (Poster #97)

Kristen Lee Miller is a senior Forest Recreation major at the University of Wisconsin Stevens Point. She is a second-generation fire manager and has participated in over 14 burns on over 5,000 acres. She currently serves as the Crew Leader for the UWSP Fire Crew and was the Crew Secretary for the 2011-12 school year. She plans to graduate in December 2013 and go on to earn a masters in Wildland Fire Management. The high point of her fire career so far was serving as a Public Information Officer on the Honey Prairie Fire on the Okefenokee National Wildlife Refuge in 2011.

UWSP Fire Crew: A Mechanism for Restoration, Suppression and Preparing the Next Generation of Fire Managers

The University of Wisconsin Stevens Point (UWSP) developed a Fire Crew in 1986, making it the first fire crew directly associated with a university. The UWSP Fire Crew is a para-professional organization that assists with fire management throughout the state of Wisconsin. The Fire Crew assists both public and private landowners with prescribed burns, often for prairie and oak savannah restoration. Many of the agencies managing public lands in Central Wisconsin call upon the Fire Crew members to augment their own personnel during prescribe burns UWSP's Fire Crew also assists suppression agencies whenever their own resources are overwhelmed, or whenever a hand crew is required for suppression. For the past twenty-five years, perhaps the greatest impact the UWSP Fire Crew has had may be the hundreds of students who completed their basic fire training and gained valuable experience through their participation in Fire Crew. By already having their basic fire training completed, students have a competitive edge when seeking summer employment. In an average year, the Fire Crew has 100 members; the majority of these members spread across the nation for summer jobs in fire management. Many also move into permanent, fire –related jobs upon graduation. The spread of Fire Crew members throughout the country has established a legacy that the current Fire Crew strives to build upon.

Miller, Mary   (Poster #72)

Mary Ellen Miller is currently working as a research engineer at Michigan Tech Research Institute. Her educational background is Environmental Engineering, Imaging Science and Physics. She enjoys utilizing remotely derived image data in physically based environmental models. She has a strong interest in fire science especially fire effects and mitigation. Recent projects include mapping historical fires in North American Tundra, development of a physical model of post-fire dry ravel, reducing noise in LiDAR waveforms for determining forest biometrics, mapping wetlands and prioritizing fuel reduction treatments. She would love to work on BAER Teams (Burned Area Emergency Rehabiliation) as a hydrologist or GIS specialist. Her most recent accomplishment was modeling potential post-fire erosion for the High Park fire in Colorado.

Modeling Post-fire Erosion: Linking Remote Sensing and a Process-based Hydrological Model for Post-fire Remediation: High Park Fire, CO

BAER Teams must rapidly assess burn scars and determine where and if to apply remediation treatments. BAER teams commonly rely on satellite derived burn severity maps and post-fire erosion modeling tools. In this poster we demonstrate how to combine these two tools to support the BAER Team for the High Park fire that burned 87,200 acres in Larimer County, Colorado.   Spatial soil, land cover and DEM layers were prepared ahead of time along with a methodology for rapidly merging satellite derived burn severity maps with the soil and vegetation data layers. The entire burn scar for the High Park fire was modeled in less than three days allowing the predictions to be available for operational use by the BAER Team.

Mishra, Bikash   (Poster #44)

BIkash Kumar has a M.Phil in Environmental Sciences (M.Sc. Env. Sc.); Jawaharlal Nehru University, New Delhi, India and a Masters Degree in Environmental Sciences (M.Sc. Env. Sc.). He earned his Bachelors in Environmental Sciences (B.Sc. Env. Sc.)at Tribhuvan University Nepal. He is a research scholar, School of Environmental Sciences, JNU, New Delhi.

Effects of fire on ability of seedlings to grow into saplings in Sal (Shorea robusta Gaertn. F) Forest in Sabaiya Collaborative Forest, Parsa, Nepal

The effects of fire on ability of seedlings to grow into saplings were studied. It was found that fire had negative impact on seedlings ability to grow into saplings and later stage. Despite having satisfactory regeneration of seedlings of Sal (16960 stem/ha), very few (120 stem/ha) saplings were recorded. Similar was the case with other tree species. Each year occuring mild fire enriched the soil but it also destroyed the delicate seedlings. The forest had the dominance of Sal (68.8%) followed by Mallotus philipensis (6.8%), Syzygium cumini (4.8%), Terminalia tomentosa (4%), Semecarpus anacardium (4%) & other less than 4% each. Phytosociological study of the forest was carried out and Species Diversity, Importance value index, Basal Area, density & Regeneration status were accessed. Edaphic charecteristics were also studied which revealed that soil was sandy loam to loamy sand, slightly acidic to near neutral (pH 5.34-6.88), soil nitrogen moderate (0.12-0.25%) & Organic carbon moderate (1.5-3.0%).   The study thus revealed that despite having other conditions favourable for the Sal forest, fire had greatly affected the seedlings to be able to grow into saplings and later stages.   Keywords: Fire, Sal, Regeneration, Seedlings, Saplings

Mohr, Helen   (Poster #92)

Thomas A. Waldrop, Research Forester, USFS Southern Research Station

SCIENCE DELIVERY IS A TWO-WAY STREET – DEVELOPMENT OF THE CONSORTIUM OF APPALACHIAN FIRE MANAGERS AND SCIENTISTS (CAFMS)

"We have a lot of information but it is scattered and too difficult to find." "Managers should read our publications, all the information is there." "Research publications are too specific and difficult to read, especially when units are metric." "I do not have time to meet and greet every land manager to sell my science." "I am uncomfortable calling a scientist that I do not know." These are just a few of the more common comments expressed at three regional workshops in the fall of 2009 to plan the Consortium of Appalachian Fire Managers and Scientists (CAFMS). Over 75 participants from across the Appalachian region were introduced to the topic of Science Delivery and asked what forms of delivery they were familiar with and which of these work well for them. Answers were diverse, reflecting the wide range of cultures and management problems encountered in the Appalachian region.   The overall result of Consortium planning was a clear indication that managers and scientists do not communicate well and that both groups could gain much knowledge by increasing interaction. Suggestions were made for almost 50 types of science delivery but most managers and scientists were looking for very similar products. This poster will introduce the CAFMS and the topic of science delivery. It will also describe some of its unique plans for improving communication between scientists and fire managers.   KEYWORDS: prescribed fire, southern Appalachian Mountains, technology transfer.

MontBlanc, Eugenie   (Poster #88)

Eugenie MontBlanc, Great Basin Fire Science Delivery Coordinator, University of Nevada, Variation in ant populations with elevation, tree cover, and fire in a pinyon-juniper-dominated watershed.

Great Basin Fire Science Delivery

The Great Basin Fire Science Delivery project assists field-level land managers in identifying and accessing the best fire and resource science information available. The goal is to improve technical and policy decision-making through enhanced communication and information sharing. This project is part of the Joint Fire Science Program's national network of regional knowledge exchange consortia established in 2010 to address current challenges in fire and fuels management due to increased land use, invasive species, shifting climate, and complexities with differing agency missions and policies. To determine specific technical information and delivery needs for the Great Basin, the Fire Science Delivery project conducted a needs assessment of 111 federal land management agency personnel in Nevada, Utah, Idaho, and Oregon. Land managers requested information syntheses, online training, a web-based clearinghouse of information, networks of experts, and field workshops. To address these needs, the fire science delivery project established a list serve and sends newsletter updates about fire and resource science information and events, established a website of fire and resource science information, hosts webinars and field days, funds and develops needed syntheses for our region, supports online class development and training opportunities, and has developed an interagency restoration cadre. We expect public and private land managers to benefit from this project by having a place and a person to turn to for answers to technical questions, leads to research contacts, and a forum to communicate technical needs. We expect research scientists to benefit from this project by gaining new ideas and partnerships for research and by providing new methods of outreach for research results.

Moriarty, Kevin   (Poster #32)

Kevin Moriarty-CSU SAFE President; Research Assistant; Colorado State University

Colorado State University Student Association for Fire Ecology

The Colorado State University(CSU) Student Association for Fire Ecology(SAFE) consists of students from diverse disciplinary backgrounds ranging from ecology, engineering, economics, fire science and resource management. Outreach and collaboration have provided the CSU SAFE chapter with extended opportunities to explore fire ecology sciences in the classroom and hands on experiences in the field. In 2012, CSU SAFE organized a field trip to the Four Mile fire site, hosted a graduate level seminar in fire ecology and brought five students to Nebraska to conduct 2,500 acres of prescribed fire.

Mueller, Joshua   (Poster #49)

Joshua R. Mueller, Graduate Research Assistant, Kansas State University

Relative Role of Fuel Source Fluctuations on Disturbance Fire Regimes within Mesic Deciduous and Oak-Savannah Forests in Southern Wisconsin, USA

Fire is a result of interactions between climate (precipitation and temperature), vegetation (fuel availability and fuel taxonomy) and ignition (lightning or human), but understanding the individual effects of these variables on fire regimes can be challenging due to the substantial ecological complexity among them. Several studies have suggested that climate variability is the primary driver of changes in vegetation throughout the upper Midwestern USA. However, long-term studies suggest that fire may be more of a significant driving force on vegetation and available fuel bed fluctuation than previously suggested. To address the relative roles of climate and fire in the long-term composition of deciduous forests, a transect of four study sites were investigated across the prairie/forest boundary. Sediment cores were analyzed to understand the sensitivity of vegetation as fire regime and moisture availability changed over the past 10,000 years. High-resolution charcoal analysis from lacustrine sediment of Butler Lake, Lake Seven, Comstock Lake, and Lake George characterized fire activity and fuel source fluctuation across a moisture gradient from wet southern Mesic forest towards dry Prairie Oak Savannah over the last 10,000 years. Fire frequency ranged from 1 to 8 fire events per 1,000 years across sites during the Holocene. Changes in fire frequency were more synchronous at the two sites with higher moisture availability.Fire intensity was likely varying over time between stand-replacing crown fires and low-intensity surface fires as reconstructed from the charcoal morphology classification method. Both climate and fire were shown to influence long-term vegetation composition through feedbacks between fire and fuels.

Northway, Jennifer   (Poster #94)

Jennifer L Northway Alaska Fire Science Consortium Coordinator Bureau of Land Management – Alaska Fire Service Jennifer has been actively involved in the fire management community in Alaska for over 10 years. She brings a wealth of knowledge and experience in fuels and fire ecology, fire management and research collaboration to the Alaska Fire Science Consortium.

The Alaska Fire Science Consortium: Bridging the Gap in Fire Science Delivery

The need for awareness, understanding and application of wildland fire science information has grown immensely as managers are faced with ever challenging decisions in today's fire environment. The "best available" science is often not readily accessible, written in a digestible format, or presented in a context relevant to fire management plans and projects. The Alaska Fire Science Consortium (AFSC) is one of fourteen regional consortia that have formed a national collaborative science delivery network with the goal of accelerating the understanding and adoption of fire science research by stakeholders. The AFSC strives to strengthen the link between research and on-the-ground application by promoting two-way communication between managers and scientists, providing an organized fire science delivery platform, and facilitating collaborative scientist-manager research development. To achieve these goals, the AFSC hosts a variety of events including both Alaska-wide and topic specific workshops, webinars and field site visits. Topics of discussion range from fuel treatments to fire and climate interactions to fire modeling. Videos and presentations are available on the on-line archive for easy access. Additional products include research summaries and project factsheets written for use by managers, monthly newsletters, fire science highlights blog, Alaska Fire Reference Library, help desk, and website (http://akfireconsortium.uaf.edu). Using both formal and informal feedback, we continually refine and improve our products to meet the needs of our stakeholders in Alaska. Our focus for the next two year period will be on actively enhancing communication between fire scientists and fire and land managers who work in boreal forest and tundra ecosystems.

Ohnishi, Masahiro   (Poster #14)

I am Masahiro Ohnishi, a current graduate student working as a graduate research assistant for the Borderlands Research Institute under Sul Ross State University. My current contributions include my thesis project and working with the South Texas Native under the Caesar Kleberg Wildlife Research Institute. Both jobs are strongly related to environmental restoration and have made me consider different approaches to managing landscapes from various disturbances. I was a teacher's assistant for the senior level Range Inventory course in Spring 2012. I previously worked as a project assistant at the Chihuahuan Desert Research Institute for three years and helped facilitate the CDRI grassland restoration and various other projects. I am also a current member of the Texas Master Naturalists.

Influence of fire and succession of microbial communities after disturbance in the Chihuahuan Desert grasslands

A historical major wildfire known as the Rock House Fire occurred April 9, 2011. The fire burned through 90% of the Mimms Ranch and the west side of Marfa and continued to burn to the Davis Mountains which are more than 20 miles away. Lack of natural resources for animals and plants because of the wildfire and exceptional drought has caused considerable environmental changes in West Texas. Evaluating the composition of microflora in soil-surface communities is essential to overall rangeland health. Microflora of soil-surface communities create roughened surfaces, which increase rainfall infiltration, decrease water runoff volume and velocity, and hold seeds and organic matter. The most dominant species in the soil communities are bacteria and archaea. some species have roles for biogeochemical cycles such as the nitrogen, carbon, and iron cycle. Four major objectives for this research are; 1) Describe the microflora of the soil surface to genus level on burned, unburned, and trampled sites, 2) Examine recovery processes of the microflora of the soil surface after fire, 3) Evaluate mechanisms of recovery and growth of the microflora of the soil surface in the Chihuahuan Desert, and 4) Examine relationships between the microflora and herbaceous plants. A total of 18 samples of the soil from 3 burned, 3 unburned, and 3 trampled sites across the Mimms Ranch were collected in early and late summer. There are 3 major research procedures; 1) extract and amplify total DNA from soils; 2) measure N, C, Fe, pH, and salinity levels; and 3) vegetation transects for basal and canopy cover using a ⅛ m² Daubenmire quadrat transect, belt transect, and line intercept method. Mean of salinity and pH level of late summer was lower than results of early summer. Concentration of DNA and number of vegetations of late summer increased significantly.

Olson, Diana   (Poster #45)

Diana L. Olson FRAMES Project Manager University of Idaho My background includes fire history research and fuels research, and my current focus is technology transfer.

Boreal Forest Fire History in Alaska: Review, Synthesis and Data Compilation

The goal of this project was to compile and synthesize existing Alaska boreal forest fire history literature and datasets. This includes a literature review and synthesis of 378 references related to fire regimes in boreal forests in Alaska, including individual summaries for 28 fire history studies. The review and synthesis is currently in draft form ("Fire Regimes of the Alaskan Boreal Forest") and is organized by fire regime components, spatial distribution of regimes by vegetation type, and temporal variability of fire regimes across multiple scales. Fourteen existing published and unpublished fire history (or stand age) datasets were compiled (and as necessary, processed) into the standardized Alaska Fire History Database, totaling 2,786 plots and 13,585 samples. The database includes summarized fire dates, possible fire dates, and estimated tree establishment dates. Additionally, plots were assigned to an ecoregion and a climatic zone. Data summarized by plot are available through a dynamic map interface (within the Alaska Fire and Fuels Research Map). Finally, some of the project funds were used to clean up and improve data within the Alaska Large Fire Database, a database initiated in the early 1990s that includes reported fire locations since 1939 and fire perimeters since 1942. Improvements resulted in indentifying and digitizing 417 missing fire perimeters, and 5.8 million additional acres of burned area were represented. Please visit www.frames.gov/alaska/borealfirehistory to access the draft literature review, the databases, and the online map. Project funding was provided by the Joint Fire Science Program (Project No. 06-3-1-26: Compiling, Synthesizing and Analyzing Existing Boreal Forest Fire History Data in Alaska).

Oram, Gary   (Poster #22)

As a former staff reporter at the Dillon Tribune, Gary Oram became an accredited member of the Montana Newspaper Association, and won honors for best Montana sports column, 2010. At present, he is working closely with The National Council of Science and the Environment, to produce a series of presentations during the 13th National Conference on Science, Policy and the Environment, January 15-17, 2013, in Washington D.C. As a Master's candidate at the University of

Montana, he works in wildland fire, and with alternate sources of energy. He is a Firefighter Type, and has preformed initial and extended attack on over 50 Class A and B forest fires.

Using the carbon cycle to inhibit global warming: the environmental and economical benefits to burning biomass.

Viewing the charts and graphs demonstrating the consumption of electrical energy, oil, natural gas, and coal world-wide the earth suddenly becomes finite. Viewing this information concerning only the United States demonstrates a frightening aspect. Viewing this information on a 24" by 34" posterboard at ten feet away, along with possible means to stall or inhibit global warming, continue to supply the growing demand for energy, and understand how all this is closely related to forest fire, was my goal when I assembled the posterboard I am prepared to present.

Palmer, Karen   (Poster #23)

Karen Palmer is currently the Lead Fire Effects Monitor at Yosemite National Park. She also recently graduated (May 2012) with an M.S. degree in Forestry from Northern Arizona University. Areas of interest include fire and fuels management, fire modeling, and identifying ways to make long-term monitoring successful through implementation of the adaptive management cycle. This winter she will be working with her major professors to publish work from her Master's thesis.

Modeling long-term changes to the ponderosa pine forests of Grand Canyon National Park

Grand Canyon National Park's fire management program has utilized prescribed fire and wildland fire for over 20 years to reduce fuel loading and the potential for extreme fire behavior in order to obtain desired conditions of the forest. However, a better understanding of the long-term changes in stand structure and fuel characteristics following management activities is needed for the continued support of fire as a land management tool in Grand Canyon National Park. This study compares the long-term effects of several possible management scenarios across Grand Canyon National Park's ponderosa pine (Pinus ponderosa) forests on the South Rim. The Fire and Fuels Extension (FFE) of the Forest Vegetation Simulator (FVS), a forest growth and yield model, was employed using data from Grand Canyon's fire effects monitoring program. Simulations were run in FFE-FVS using various management and regeneration scenarios to understand the possible trends in fuels characteristics, stand structure, and potential fire behavior for 50 years into the future. The scenarios included a no-treatment (control) scenario, an 8-year burn interval (the current interval employed), a 16-year burn interval, and a scenario which alternated the burn interval between 8 and 16 years for the length of the simulation. We further simulated the natural variability of ponderosa pine regeneration in the Southwest by manually entering in low and high regeneration rates of the dominant tree species obtained from Grand Canyon's fire effects monitoring program data. These results have key management implications for Grand Canyon's fire management program. The modeling results suggest that under a low regeneration rate burning every 8 years will produce stand structures, total surface fuel loadings, and potential fire behavior or fire effects that are within desired conditions for almost all of the variables we analyzed. The FFE-FVS modeling results also suggest that the long-term effects of the differing burn scenarios may be heavily dependent on the potential for high or low regeneration rates post-fire. Therefore, we recommend that a good management strategy be guided partly by the observed post-fire regeneration rates and we advocate for the use of all available information to guide the adaptive management cycle.

Peterson, Laura   (Poster #69)

Name: Laura Peterson Title: Fire Ecologist Affiliation: Dixie and Fishlake National Forests   I was recently converted from a fire ecologist intern position to a Fire Ecologist for the Dixie and Fishlake National Forests. I have collected and summarized fire effects monitoring data for the past five years on the two forests.

What do I monitor? How to use your objectives effectively.

Creating measurable objectives before both wildfires and prescribed burns can show short and long term fire effects and help set and achieve future fuels/fire management goals. Objectives for the 2007 Toad wildfire in southwestern Utah were used to create a monitoring plan to collect pre-burn and post-burn fire effects data. Data collected from random plots by district fuels crews and the Student Conservation Association crew show changes in fuel loading and tree species composition from the Toad wildfire. The data summary shows if and when objectives were met, allowing resource managers better insight for future burn plans or wildfire objectives in similar ecosystems.

Pickett, Elizabeth   (Poster #85)

Elizabeth has worked with Hawaii Wildfire Management Organization since 2008. As Executive Director, she manages a staff of four and is leading the organization forward on numerous community outreach and education projects. Recently, she contributed to and helped coordinate a multi-partner planning process to create the Pacific Fire Science Consortium. Elizabeth earned a master's degree from the Yale School of Forestry in 2007, and a bachelor's degree from UC Berkeley in 2000.

Pacific Fire Science Consortium - The Hottest Partnership in the Pacific

The Pacific region is generally underrepresented in fire science and technology despite an urgent need for detailed, relevant and accessible information. While initial efforts have been made in understanding fire dynamics, ecological impacts, and fuels mitigation there is a growing need for additional region-specific fire research. To maximize the value of this next generation of fire science, effective communication and bidirectional information transfer must be expanded and formalized so that future research is guided by manager needs, and knowledge and tools gained from the science are efficiently transferred back to end-users. The Pacific Fire Science Consortium was recently formed and funded to address this need for a collaborative and regionally specific approach toward effective fire prevention, mitigation, and management, and to stimulate and utilize "best available" research to reduce wildfire management costs and enhance our ability to effectively protect natural, cultural, and community resources from wildfire. The consortium is working to develop a means of transferring knowledge among scientists, resource managers, decision-makers, fire suppression agencies, and communities in Hawaii and the U.S. affiliated Pacific through the following initial deliverables: consortium website, calendar of Pacific-based wildfire-related trainings, searchable bibliography of journal articles relevant to the region, wildfire-focused decision support tools, support of a wildfire management-focused outreach liaison, and the creation of a fire science-focused University of Hawaii Extension Specialist position. The consortium is part of the national network of Joint Fire Science Program Knowledge Exchange Consortia.

Ramsey, Rebecca   (Poster #17)

I am Rebecca Ramsey, an undergraduate student at the University of Idaho. I have participated as a technician in stream, rangeland, wildlife, forest, and fire ecology research throughout my college career. This last summer I had the opportunity to work with a member of the Northern Rockies IGERT team which studies the effects of climate change on disturbances in forest ecosystems. My senior thesis is a part of this larger project.

Post-fire microsite selection of Pseudotsuga menziesii seedlings as influenced by   burn severity, aspect, and elevation

Extensive areas of lower montane forests across the Pacific Northwest burned in the year 2000. We studied how the burn severity, aspect, and elevation of these fires affected P. menziesii post-fire tree regeneration by comparing characteristics of microsites with established seedlings to those generally available in the same location. We randomly selected 49 plots with varying combinations of low, moderate, and high burn severity, northeastern and southwestern aspects, and low, mid, and high elevations in locations that burned in 2000 within Idaho and Montana wilderness and adjacent areas that had not been planted. Within each location, we sampled three 1 m X 1 m quadrats placed at 0 m, 30 m, and 60 m along a transect, measuring fractional cover of rock, bare soil, litter/duff, moss, tree bole, and vegetation in addition to percent cover of grass, forb, shrub, and tree vegetation. Percent overstory tree canopy cover was also measured at each quadrat. The same measures were made at three additional quadrats placed around the closest P. menziesii seedlings. We analyze the paired plots to test our hypothesis that microsites with seedlings have higher fractional cover of bare soil, litter, and tree bole with less grass cover, and that this will be most pronounced on south aspects and on high severity burns. Understanding the microsite conditions under which P. menziesii seedlings successfully regenerate will help determine areas in which post-fire regeneration will be most (and least) successful, particularly if future fires in the region are larger and more severe. This study is part of a larger project which focuses on forest resilience to climate change with effects likely most pronounced following high severity fires, on drier aspects, and at lower elevations.

Ranseen, Susanne   (Poster #11)

My name is Susanne Ranseen I am second year graduate student at Oregon State University. I am currently working on my Masters of Interdisciplinary Studies combining the fields of ecology, forest management, and history.

The Schultz Fire: A look at historic management effects of fire severity in dry forested systems.

In June of 2010, the Schultz Fire burned in the Coconino National Forest outside of Flagstaff Arizona. Only one of several fires burning in the area that month, the Schultz fire eventually burned 15,000 acre, 13,000 of these in the first four hours of

the fire. Started by an abandoned campfire, the Schultz fire would ultimately cost $10 million in suppression and $58 million in damages and repairs due to the flooding that followed the fire during the annual monsoon. The Schultz fire may be able to shed light on the ever-growing concerns on the state of fire in dry forested systems, particularly those dominated by Ponderosa Pine. Was the Schultz fire a stand-alone event of high severity fire, or is it an example of increasing high severity fires in a system thrown out of balance? How do such areas recover after such a disturbance? How has past management affected these types of fires and how can future management restore balance and avoid such large high severity fires in the future?

Reid, Sharon   (Poster #18)

Sharon Reid is currently undergoing Masters by research in the fire ecology field at Monash University, Victoria Australia. Sharon began her ecology career as a field researcher for local goverment but this was placed on hold with the advent of children. She has worked in the areas of reptile behaviour and ecology and waterways health along with an earlier career in oral health and has two publications to her name so far.

Habitat suitablility for rehabilitated wildlife after fire.

Fire, a common occurrence in Australia, has an enormous impact on habitat but also results in large numbers of injured fauna needing care. Post release follow up research on rehabilitated possum sp. has rarely been undertaken and in the few studies available the survival rates have been poor. Narrowing down the specific requirements for a successful release site in relation to its fire history has not been attempted. This study aims to investigate whether fire history can be used as a reliable indicator of the suitability of release sites for rehabilitated possum sp. Habitat and fauna surveys have been carried out in areas of Lowland forest with differing fire histories and results are being investigated to determine which appear to be suitable release sites. Wildlife carers will be surveyed to investigate their release site selection criteria and priorities. Rehabilitated possums are intended to be released into areas deemed suitable and their progress followed to determine the success of the release. The information gathered is intended to aid wildlife carers when selecting release sites and also should be useful in relation to planned burning by government agencies.

Rogers, Michael

Michael J. Rogers started his career with the US Forest Service in June of 1957 as a firefighter on the Chilao Hot Shot Crew located on the Angeles National Forest. He graduated from the School of Forestry at Oregon State University in 1966. Although he served in a variety of positions after becoming a Forester he always maintained his interest in fire. In 1967 he attended a workshop on prescribed burning and remained involved in the application of prescribed fire to the present. After retiring at the end of 1999 he went to work as a consultant with Firewise 2000, Inc. and started his own firm, Fire Management Consulting. He has co-authored Protecting Life and Propety from Wildfire, published in 2005 by NFPA and co-authored a Fire Technology article entiled Protecting Lives and Property in the Wildland-Uran Interface in April 2011.

A New Hghly Effective Tool for Prescribed Burners

ICL Performance Products has developed a highly effective, easy to apply Gel Concentrate for treating highly flammable adjacent fuels on Prescribed Fire Projects. This new recently approved product, PHOS-CHEK Insul-8 gel, when mixed with water at the rate of 1 gallon of Insul-8 to 100 gallons of water provides a highly effective inflammable barrier for up to an hour or more after application. This very economical product was just used to burn plots within the middle of a highly flammable, continuous cover of thick perennial grasses on San Clemente Island in southern California. Our session will include a power point presentation that describes the mixing, application and visual results that clearly show the effectiveness of this new product. The product does not diminish the need for clear objectives for a proposed burn and a prescription that determines the burning window. The PHOS-CHEK Insul-8 did give us a distinct advantage by rendering the highly flammable adjacent fuels unavailable to ignition sources (airborne brands, embers, radiant heat, direct flame impingement, spilled burning drip torch fuel, etc.). We will conclusively demonstrate the effectiveness of this product by showing what occurred when we flagged a large circle in a stand of cured, highly flammable perennial grasses without any other firelines and sprayed the outer perimeter of the flag line with Insul-8 and then lit the interior of the flagged circle under the following conditions: full sun, RH 54,wind NW, wind speed 4mph, fine fuel moisture 7 at 1:14 PM, PDST.

Saperstein, Lisa   (Poster #70)

Lisa Saperstein has been working with fire ecology in Alaska since 1989, when she started her Master's work on tundra fire and caribou at the University of Alaska Fairbanks. She has been with the U.S. Fish and Wildlife Service in Alaska since

1993 serving as a refuge wildlife biologist and, since 2010, the regional fire ecologist. Publication note: Maier, J.A.K., J.M. Ver Hoef, A.D. McGuire, R.T. Bowyer, L. Saperstein, and H.A. Maier. 2005. Distribution and density of moose in relation to landscape characteristics: effects of scale. Canadian Journal of Forest Research 35:2233-2243.

Alaska Wildfire Research Needs: Connecting Scientists and Managers

The mission of the Alaska Wildland Fire Coordinating Group (AWFCG) is to provide a forum that fosters cooperation, coordination, collaboration, and communication for wildland fire management and related activities in the State of Alaska. The AWFCG is comprised of state and federal agencies and Native organizations involved in fire management activities, and it sponsors a number of committees that focus on specific topics of fire management and science. The Fire Research, Development, and Application Committee (FRDAC) is chartered to identify and prioritize fire research needs in Alaska and facilitate the development and exchange of information and applications to meet the needs of AWFCG member agencies. The FRDAC is tasked with developing and prioritizing a detailed description and analysis of fire management research needs and identifying options and partnerships that best address these needs. To accomplish this, the FRDAC generates a prioritized Fire Research Needs List every two years. Topics are solicited at the AWFCG Fall Fire Review, which is attended by fire and land management personnel from AWFCG member organizations. Committee members also solicit topics from other employees within their organizations who may not have attended the fall meeting in order to obtain a comprehensive list of fire research topics. Although funding is not specifically allocated to address the topics, the top research needs have been submitted to the Joint Fire Science Program by the Alaska Fire Science Consortium for use in developing annual Requests for Proposals, and the list is often cited as justification in research proposals. AWFCG will provide letters of support for select proposals that address research needs and meet the following criteria: have direct management application, are of use to multiple agencies, and have a high likelihood of tech transfer. In some instances, individual agencies have been able to provide funding for projects.

Schupp, Eugene   (Poster #66)

Eugene W. "Geno" Schupp is a Professor of Plant and Restoration Ecology in the Department of Wildland Resources and the Ecology Center at Utah State University. His research focuses on seed and seedling ecology and seeks to understand what limits recruitment of new plants in the Intermountain West of the USA and in southern Spain. Subjects of research range from invasive species with little apparent limits to recruitment to federally listed endangered plants. His publications are diverse, but he is best known for developing the widely used framework of Seed Dispersal Effectiveness.

Effects of Sagebrush Fire and Fire Surrogate Treatments on a Great Basin Seed Bank Community

The influence of sagebrush fuels and restoration treatments on Great Basin vegetation dynamics has been well documented but the impacts of treatments on the seed bank community has received little attention. The effects of fuels reduction/restoration treatments (prescribed burn, tebuthiuron herbicide, and imazapic herbicide) on seed bank community composition and dominant seed bank species densities were evaluated. In addition we determined whether the pre-treatment seed bank or the aboveground vegetation was more similar to the vegetation following the fuels/restoration treatment. Alyssum desertorum, Bromus tectorum, Ceratocephala testiculata, and Poa secunda dominated the seed bank community; the first three are exotics. The seed bank community shifted after restoration treatments, especially in the tebuthiuron and Plateau treatments. Prescribed burn was the only treatment that affected seed density. The post-treatment vegetation community was more similar to the pre-treatment vegetation than to the pre-treatment seed bank community, and perennial comparisons were as similar as the annual comparisons. Results suggest seed bank community composition and seed density were temporally and spatially highly variable. Furthermore, tebuthiuron and imazapic may have altered community composition whereas prescribed burn affected seed density. This research also implies that the pre-existing vegetation may be a better indicator of the vegetation community following fuels/restoration treatments than is the seed bank community.

Shaff, Scott   (Poster #75)

Scott E. Shaff is an Ecologist for the U.S. Geological Survey at the Forest & Rangeland Ecosystem Science Center. His research focuses on fire and fire surrogate treatment effects on arid ecosystems, restoration ecology, and invasive plant species impacts. He completed his Forestry Science degree from Northern Arizona University. Scott has worked as a Forest Ecologist and a wildland firefighter for the Department of Defense at Fort Lewis Military Base in Washington. He currently manages the day-to-day operations of nine SageSTEP study sites.

Short-term results from arid SageSTEP (Sagebrush Steppe Treatment Evaluation Project) fuel treatments

Land managers throughout the Intermountain West are acutely aware of the growing problem of Bromus tectorum (cheatgrass) invasion into sagebrush steppe ecosystems. Both scientists and managers are searching for ways to combat this problem and to find indicators of invasion potential. Part of the solution is to understand how sites respond to disturbances. SageSTEP is a regional experiment designed to evaluate different methods to maintain sagebrush habitat while reducing fire fuel loads in this region. Fuel treatments being evaluated at the whole-plot level are prescribed fire, mechanical thinning of Artemisia tridentata ssp. Wyomingensis (sagebrush) by mowing, and aerial application of the herbicide tebuthiuron (Spike 20P®) to thin sagebrush. Additionally, the pre-emergent herbicide imazapic (Plateau®) was applied to subplots within fuels treatments to reduce cheatgrass. Preliminary results revealed that prescribed fire reduced perennial tall grass cover immediately post fire (9% to 4%), but cover recovered quickly. Distances among perennial plants increased within the fire treatment from 200 cm to 330 cm. Fire was the only treatment to reduce total fuel load through the combustion of shrubs and downed woody debris (DWD). Cheatgrass cover increased twofold in the fire and mowing treatment by year 3 post-treatment, while the application of Plateau® significantly reduced cheatgrass cover (19% to 6%) and annual forb cover (10% to 5%) in all treatments for up to three years. Mowing reduced shrub cover and biomass at all sites, but converted biomass to DWD, which may have increased fuel continuity. The application of Spike 20P® had no sizable effect on fuel load or vegetation community composition. Most vegetation trends indicate that these plant communities are still adjusting to the disturbance. These preliminary results highlight the importance for long-term monitoring to fully understand ecosystem resilience as well as fuel dynamics after fuel treatments in arid sagebrush steppe.

Smith, Jane   (Poster #93)

Jane E. Smith Research Botanist Pacific Northwest Research Station   Research in my lab explores the impact of severe wildfire and timber harvesting on soil bacterial and fungal communities and other measures influencing soil productivity. Such information is essential to fine-tune post-fire treatment methods and speed the forest recovery process. Jennings TN, Smith JE, Sulzman EW, Cromack K Jr., McKay D, Caldwell BA, Beldin SI. 2012. Impact of postfire logging on soil bacterial and fungal communities and biogeochemistry in a mixed-conifer forest in central Oregon. Plant Soil 350(1): 393–411.

Soil microbes undaunted, soil nutrients reduced by postfire salvage logging

It is well established that severe wildfire negatively impacts soil nutrient pools; however, the effect of postfire timber removal on soil productivity is not well understood and its application remains controversial among land managers, scientists, and the interested public. Postfire logging recoups the economic value of timber killed by wildfire, but whether such forest management activity supports or impedes forest recovery in stands differing in structure from historic conditions remains unclear. The aim of this study was to determine the impact of postfire logging on measures influencing soil productivity. We compared soil bacterial and fungal communities and biogeochemical responses of 1) soils compacted, and 2) soils compacted and then subsoiled, to 3) soils receiving no mechanical disturbance, across seven stands in a mixed-conifer forest in central Oregon, 1-3 years after postfire logging. Soil strength of the sandy loam volcanic soils was greatest in the compacted treatment and least in the subsoiled treatment. Compaction decreased plant-available nitrogen (N) on average by 27% compared to no mechanical disturbance, while subsoiling decreased plant-available phosphorus (P) on average by 26% compared to the compacted and non-mechanically disturbed treatments. Neither bacteria nor fungal richness significantly differed among treatments. A shift in bacterial communities corresponding with an increase in plant available N and P suggests that soil microbes in these postfire landscapes are resilient to mechanical disturbance. Results suggest that nutrients critical to soil productivity were reduced by mechanical applications used in timber harvesting, yet soil bacteria and fungi, essential to mediating decomposition and nutrient cycling, appeared resilient to mechanical disturbance. Management decisions about whether or not to harvest fire-killed trees should be balanced with the recovery potential of a site, and the potential for high densities of fire-killed trees to increase the area of severely burned soil in the event of future fire.

Spaul, Hannah   (Poster #91)

Hannah Spaul currently serves as the Director of Land Management for The Nature Conservancy in Wisconsin. In that capacity she also serves as a Co-PI for the Tallgrass Prairie and Oak Savannah Fire Science Consortia. She was a founding member of the Wisconsin Prescribed Fire Council and currently serves on the board. With more than 14 years of experience in prescribed fire in the upper Midwest she is committed to bringing a heightened national awareness to the unique opportunities and challenges of implementing fire at scale in the region, and brining partners together to address those challenges collectively.

Tallgrass Prairie and Oak Savanna Fire Science Consortium

Despite general recognition of the importance of fire to prairies and savannas of the central United States, significant impediments exist to using fire as widely and effectively as possible. Fire science information development and exchange is limited. To this end, we have developed the Eastern Tallgrass Prairie and Oak Savanna Fire Science Consortium to identify existing fire science networks and delivery capabilities in the region, and to enhance the communication and evaluation of fire science information beyond current capabilities. The effort is funded by the Joint Fire Science Program Consortia effort. Specifically, the consortium proposes to (1) facilitate improved information exchange among fire practitioners to identify regional fire science needs, (2) develop a framework for evaluating fire management practices, and (3) develop a network by which fire science information will be accumulated, synthesized, and disseminated. Initially, our organization has dedicated itself to understanding the needs of the regional fire community, and determining how to best structure the consortium to meet these needs.

Stambaugh, Michael   (Poster #54)

Michael Stambaugh, Assistant Research Professor, University of Missouri - Columbia, He has documented historic fire regimes throughout the eastern U.S.

The Trace of Fire in Eastern Native America

Written in the rings of trees is a history of fire in eastern Native America that tells of humans, drought, and their interactions. Based on thousands of fire scars on oak and pine trees, these quantitative fire histories move through generations and territories. Each fire scar has a date, location, and often an associated human culture and population. Here we examine the connections between the occurrence of wildland fires and populations of eastern Native Americans including the Cherokee, Chippewa, Osage, Menominee, and others. The geography of fire history sites includes Appalachia, the Great Lakes, the Great Plains, the Southeast, and the Midwest. Many fire regimes in eastern North America are found to have a human 'footprint' reflected as a temporally abrupt or rapid change in fire frequency. Interactions among drought, human migrations, and ignitions are detected in the fire scar record. In years where many sites are burned drought is often a predisposing factor and human ignitions are an inciting factor.

Stambaugh, Mike   (Poster #101)

Michael Stambaugh is the PI for the Oak Woodlands and Forests Fire Consortium.

Sharing fire science information about eastern oak woodlands and forests

Sharing fire science information about eastern oak woodlands and forests Michael Stambaugh, Joseph Marschall, and Keith Grabner   Covering much of the Central Hardwoods Forest Region, the Oak Woodlands & Forests Fire Consortium (OWFFC) is one of fourteen Joint Fire Science Program consortia across the U.S.. The OWFFC mission is to provide fire science information to resource managers, landowners, and the public about the use, application, and effects of fire. Fire science dissemination efforts include activities such as workshops, symposiums, newsletters, demonstration site visits, and literature syntheses. Each activity focuses on topics identified by regional fire practitioners as needing credible and accessible scientific information. Consortia efforts are guided by principles emphasizing inclusiveness, neutrality, and innovation. Fire science needs of oak ecosystems in eastern U.S. are primarily related to management and restoration as opposed to protection. These characteristics set a unique stage for the types of fire topics addressed and activities offered by the consortium.

Stan, Amanda   (Poster #41)

Amanda B. Stan, Research Associate, School of Forestry, Northern Arizona University   My work often applies tree-ring methods to address questions concerning past forest conditions and tree responses to disturbances. Currently, I am a USDA National Institute of Food and Agriculture Post-Doctoral Fellow, leading a collaborative project that aims to link research on forest fire ecology with educational and extension activities to assist the Hualapai Tribe (Arizona) in adapting and managing forest ecosystems on their lands for the changing environment of the coming decades.

Evaluating the probability of fire in a ponderosa pine forest in the southwestern U.S. using logistic regression and multi-model inference

Previous research has shown a link among fire, site characteristics such as those influenced by past land-use history, and drought conditions in ponderosa pine forests in the southwestern U.S. We used fire-history data from sites located in a ponderosa pine forest on the Hualapai tribal lands in northwestern Arizona to explore possible variables associated with

fire on the landscape between 1702 and 2007. We developed logistic regression models and used multi-model inference to assess the probability of a site burning in a particular year and land-use period (historical, suppression, modern) as a function of site characteristics and drought conditions. Variables representing both fuels-related (i.e., bottom-up) and climatic (top-down) controls of fire were present in the models. As time since fire increased, the probability of burning increased for all land-use periods; however, the effect of time since fire varied by period. A higher number of other sites burning increased the probability of burning for all sites; however, the magnitudes of the coefficients varied according to the spatial arrangement of the sites, i.e. the effect of other sites burning was greater for grouped sites compared to isolated sites. Drier conditions in the year of fire and wetter conditions one year prior to the year of fire increased the probability of burning. The logistic regression modeling approach allowed us to simultaneously assess the relative influence of predictor variables on the probability of a site burning in a particular year and period, providing a comprehensive understanding of the fire regime over time and space. Overall, results suggest a fuels-limited, climate-driven fire regime at Hualapai and reflect variability in land uses over time, including past fire suppression and the reintroduction of fire in the most recent decades through prescribed burning.

Steen-Adams, Michelle   (Poster #55)

Michelle Steen-Adams, Ph.D., is Associate Professor of Environmental Studies at the University of New England (Maine) and Visiting Scientist, USDA Forest Service, Pacific Northwest Research Station. Her research provides a long-term perspective to natural resource issues by integrating environmental history, historical ecology and landscape ecology. Her current work contributes to a multi-investigator project in the Eastern Oregon Cascades that employs a coupled human and natural system (CHANS) approach. She has published several papers in environmental history and landscape ecology journals, including the following: Steen-Adams MM, Mladenoff DJ, Langston NE, Liu F, Zhu J (2011) Influence of biophysical factors and differences in Ojibwe reservation versus Euro-American social histories on forest landscape change in northern Wisconsin, USA. Landscape Ecology 26 (8): 1165-1178.

Environmental History of Fire-Prone Ecosystems across Ownerships in the Eastern Oregon Cascades (1905-2010): Effects of Past Land-Use, Management, and Fire Culture on Current Forest Condition and Fire Risk

Fire managers often confront two issues when promulgating policy and implementing management directives; these constitute spatial and temporal dimensions of management problems. One, fire management is fragmented across ownerships, while this is a whole landscape problem: fires often begin on federal or state agency land then spread onto private parcels, each of which is constrained by distinct management objectives. Two, the definition of appropriate, effective landscape-scale fire management is often confounded by land use history legacies, tribal history, and socioeconomic conditions that have changed at heterogeneous rates, ranging from slow in some ownership regions to rapid in others. We address this need by developing a comparative environmental history among ownerships (USDA Forest Service, tribal, private), and at the whole landscape scale in the Eastern Cascades of Oregon. This study contributes to an integrative team project that examines human adaptation to living in fire-prone ecosystems as a coupled human and natural system (CHANS) using systems models to improve fire policy.   We address two questions: 1) How have vegetative conditions, management practices, social networks, values (cultures), and perceptions of fire risk interacted through time (ca. 1905-2010), including possible system governance by feedbacks, at ownership and whole landscape scales?; 2) Have feedbacks from these interactions produced intended and/ or unintended (perhaps adverse) consequences? Our research design focuses on the evolution of five factors: ecological community change; management practices/ objectives; social networks; environmental values, including "fire cultures"; and perception of fire risk. We employ a mixed-method approach, consisting of archival document examination, oral history interviews, and GIS technology, to conduct this analysis. We anticipate our retrospective analysis results will enable team scientists to link project model elements, such as system actors and landscape metrics, to their historical context. We expect to thereby augment understanding of this system and contribute to fire policy refinement.

Steffen, Anastasia   (Poster #42)

Dr. Steffen received her Ph.D. from the University of New Mexico in 2005. She now is Cultural Resources Coordinator at the Valles Caldera National Preserve and adjunct faculty in the Anthropology Department, University of New Mexico. She has worked in the Jemez Mountains since 1990 and has led archaeological inventory and research at the Preserve since 2001. Her research interests include prehistoric lithic technology, obsidian sourcing and hydration analyses, forest fire effects for archaeological resources, and landscape-scale management of cultural resources. Dr. Steffen is a past President of the International Association for Obsidian Studies.

ArcBurn: Linking field-based and experimental methods to quantify, predict, and manage fire effects on cultural resources

Wildfires can threaten cultural resources through direct effects that are obvious and immediate, such as destruction of structures; or may be harder to recognize, such as thermal alteration of surface artifacts. Such fire-induced changes affect survey, excavation, and interpretation of the archaeological record. Because cultural resources are non-renewable, fire damage to artifacts and sites constitutes a permanent loss of knowledge. Fuel treatments have been shown to reduce fire severity, but success is constrained by poor information on the range of fire effects on cultural resources, incomplete understanding of how magnitude and duration of heating interact to cause damage, and linkage between fire effects and operational fire models. Managers need to plan fuels treatments to minimize costs while maximizing effectiveness, make defensible "go/no-go" decisions, and triage post-fire response and rehabilitation efforts. Our project integrates cultural resources information into the fire management decision processes. Our objectives are to link field and laboratory data and experiments on fire effects to provide guidelines for best management practices for cultural resources in fire-prone landscapes. The study will quantify the impacts of wildland and prescribed fires on archaeological stone tools, architectural stone, and ceramics, synthesize available information on impacts of fire on cultural resources, and integrate project results into operational and decision support tools. We focus on the Jemez Mountains of northern New Mexico, an area that contains an extraordinarily rich array of cultural resources and diverse vegetation communities and fire regimes. Our field study area is designed to encompass the 2011 Las Conchas Fire. Methods include field-based sampling to characterize the range of environmental conditions under which archaeological resources were exposed to fire and laboratory experiments to quantify the effects on artifacts across the range of heating levels characteristic of wildland and prescribed fires.

Thode, Andrea   (Poster #84)

Andrea E Thode (Andi) – Associate Professor of Fire Ecology and Fire Science in the School of Forestry at Northern Arizona University   Andi Thode grew up in Los Alamos, New Mexico. She completed her B.S. (1996) and later her Ph.D. (2005) in fire ecology through the Ecology Graduate Group at the University of California, Davis. She has been heavily involved in the Association for Fire Ecology (AFE) since its' inception. In 2001 Andi started working as a fire ecologist for the Pacific Southwest Region of the U.S. Forest. In 2005 she left the U.S Forest Service to work at Northern Arizona University (NAU). She is currently an associate professor of fire ecology and fire science in the School of Forestry at NAU. Her research focuses on fire effects, fire monitoring and landscape level fire severity effects. Andi is the PI for the Southwest Fire Science Consortium.

Southwest Fire Science Consortium

The Southwest is one of the most fire-dominated regions of the US. Currently, in the Southwest, there are several localized efforts to develop fire science information and to disseminate it to practitioners on the ground in a practical manner. However, many of these efforts are moving in parallel, without thoughtful interaction among projects. Managers and scientists are often not aware of each other or of the external resources available. A consortium is needed to bring these parallel efforts together to be more efficient and inclusive, allowing future fire science issues to be addressed from a broader perspective with more information, more partners, and more resources. With support from the Joint Fire Science Program (JFSP), we have initiated the Southwest Fire Science Consortium to promote communication and meet fire knowledge needs of scientists and managers. We have organized the Southwestern Fire Science Consortium around three key questions: (1) What do people need to know? Information needs are assessed through workshops, surveys, and organization of a community of practice of wildland fire professionals; (2) What information is already known? Synthesis of existing science; and (3) What are the key information gaps between what we need to know and what is already known? This question leads to the identification of critical areas for new research and management experiments. By focusing on these key questions we hope provide a mechanism for managers, scientists, and policy makers to interact and share science in ways that can effectively move new information to management practices and facilitate new research based on management needs.

University of Idaho Student Association for Fire Ecology   (Poster #16)

The University of Idaho SAFE chapter is dedicated to exploring the role of fire in ecosystem processes. SAFE hopes to bring awareness of the role of fire to our local ecosystems and to describe the ways in which the public can benefit from education and through prescribed and natural fire. UI SAFE has successfully collaborated in a Service Learning trip which entailed burning within the Nebraskan landscape over spring break in 2011 and 2012.

University of Idaho S.A.F.E. Nebraska Service Learning Trip Spring 2012

In March of 2012, twelve University of Idaho Student Association for Fire Ecology students got the opportunity to assist The Nature Conservancy with the burning of a total of 2,500 acres conducted within Bassett, Nebraska. This service learning trip provided participating students with the opportunity to meet fire professionals from widely diverse backgrounds,

as well as, time and training to complete task books. Students got the oppurtunity to learn first-hand about ecologically based fire management, effects of fire and grazing in prairie ecosystems, and how fire affects species composition. Students learned how to work together and how multiple agencies are able to collaberatelly work together.

Vaillant, Nicole   (Poster #118)

Nicole Vaillant is a fire ecologist at the Western Wildland Environmental Threat Assessment Center which is part of the Forest Service Pacific Northwest Research Station

Fuel treatment effects on carbon stocks in Californian coniferous forests over time

Globally forests store about half of terrestrial carbon. Forest management, land use change, and natural disturbances all significantly affect forest carbon balance. In dry forests of the western US, wildfire is one of the largest threats to forest carbon. While fuel treatments result in initial reductions of stand carbon, they have a potential to reduce the severity of wildfires and therefore losses of carbon due to emissions from combustion and decomposition of fire-killed biomass. To better understand the impact of fuel treatments on carbon stocks, we quantified aboveground carbon stocks before and up to eight years after fuel treatments (fire-only, mastication, and thinning plus surface fuel treatment) and compared field-derived to FFE-FVS modeled values. Surface fuel and forest floor carbon stocks were significantly different among at least two treatment types 1 and 2-yr post-treatment. Live tree aboveground carbon in the fire-only treatments exceeded the pre-treatment level within 2 years of treatment. Total carbon stocks in fire-only treatment returned to 98% of pre-treatment levels after 8 years. Mastication and thinning plus surface fuel treatment total carbon stocks were still declining 5-yr post-treatment. Field-derived and modeled total carbon stocks differed by about 7% with the highest variability in carbon stored in snags.

Vaillant, Nicole   (Poster #119)

(See biographical information, above.)

The JFSP Crown Fire Behavior Synthesis Project Wants Your Input!

The Joint Fire Science Program (JSFP) is supporting a project aimed at synthesizing the currently available information on crown fire behavior in conifer forests (e.g., the onset of crowning, type of crown fire and the associated spread rate and fire-line intensity). The JFSP   09-S-03-1 project website is: http://www.fs.fed.us/wwetac/projects/alexander.html.   In addition to summarizing the existing scientific and technical literature on the subject, we are actively seeking assistance from individuals in the form of field observations of crown fires and related experiences as well as still pictures and video footage; for example, do you have a favourite YouTube presentation? We are looking for firsthand experiences of rare or perhaps unusual observations like independent crown fire runs or specific cases of conditional crown fire activity and crown fire cessation as well as instances of long-distance spotting (>2 km) from active crown fires along with the associated environmental conditions: What was happening climatically? What were the fuel types? Was there anything out of the ordinary? Did suppression play a role?   Finally, we are interested in hearing from you as to your opinions on the subject of crown fires and any specific questions and/or research needs/knowledge gaps or areas in fire behavior training that you would like to see addressed in this crown fire behavior synthesis project. For example, when implementing mastication fuel treatments how much material can be left onsite or how long after a mastication treatment is the potential risk of crown fire alleviated? Are there gaps in knowledge pertaining to crown fire such as the desire for better assessments methods for assessing crown fire risk in pinyon-juniper woodlands. Finally, we would really like to hear your general thoughts and experiences pertaining to crown fire.   So please take the time to stop by our poster area for a good old fashion "chin wag".

Vaillant, Nicole   (Poster #120)

(See biographical information, above.)

Fuel Treatment Planning with the Landscape Treatment Designer (LTD)

The Landscape Treatment Designer (LTD) program is a multi-criteria spatial prioritization and optimization system to help design and explore landscape fuel treatment scenarios. The program fills a gap between fire model programs such as FlamMap, and planning systems such as ArcFuels10, in the fuel treatment planning process by providing a systematic way of planning spatially explicit fuel treatments. The LTD uses inputs on spatial treatment objectives, activity constraints, and treatment thresholds, and then identifies optimal fuel treatment locations with respect to the input parameters. The input data represent polygons that are attributed with information about expected fire behavior and the polygon's overall con-

tribution to one or more landscape management objectives. Outputs include an attributed polygon with suggested treatment locations and various summary files. Fuel treatment plans can either be dispersed breaking the continuity of fuels or aggregated which is ideal for restoration planning. The LTD program, demonstration data, and tutorial are available for download at: www.fs.fed.us/wwetac/ltd/

Verble-Pearson, Robin   (Poster #57)

Dr. Verble-Pearson completed her Ph.D. at the University of Arkansas at Little Rock in 2012. She is currently employed as an Assistant Professor of Fire Ecology at Texas Tech University, where her research interests include fire effects on insects, plant combustibility and flammability, and ash toxicity.

Fire and Ants in Ozark Forests

Fires burn heterogeneously on landscapes, and variation in temporal and spatial intensity may be important determinants of post-fire community composition. Differences in fire intensity, even within a single fire, can significantly influence the structure of insect communities, e.g., by altering microhabitat availability and ecosystem processes such as decomposition rates. Faunal recovery periods also vary with fire intensity. We hypothesized that local arthropod community structure is influenced by small-scale variation in local fire intensity. We measured focal arthropod species richness and abundance pre- and post-fire in patches of leaf litter experimentally burned at different intensities. Immediately post-fire, abundance of focal taxa declined sharply and differed among intensities. Post-fire activity and recovery of target arthropods did not differ among fire intensities. We show that arthropod abundance is reduced by prescribed burning in the short-term, but, for most taxa, local fire intensity appears to have no effect on arthropod community parameters. These results have direct implications for the study of fire effects on arthropod communities.

Vogler, Kevin   (Poster #33)

Kevin Vogler is a graduate research assistant at Oregon State University where he is studying to complete his MS in Silviculture and Fire Management.

Oregon State University SAFE Chapter

The OSU chapter of safe "The Pyromaniacs" contains a diverse and active group of students studying all aspects of fire management and fire ecology from modeling post fire habitat availability with LiDAR data to the use of biomass from fuel reduction treatments in biofuel conversion. The OSU chapter of SAFE meets weekly to collaborate on research projects and discuss recent journal articles. In addition, the chapter has sponsor field trips to tour recent wildfires and has helped with pile burns on the school forest. The OSU chapter is currently sponsoring the Words on Fire symposium on November 1st with author and fire historian Stephen Pyne.

Vogler, Kevin   (Poster #79)

(See biographical information, above.)

Quantifying the availability of woody biomass from fuel reduction and forest health thinning on federally owned land in Oregon, Washington, Montana, and Idaho

One barrier to investment in biomass infrastructure is the uncertain availability of a suitable feedstock source. A model was developed in order to generate estimates of potential biomass availability on federally owned land in Oregon, Washington, Montana, and Idaho using current forest inventory data. Estimates were generated by performing silviculturally sound forest health and fuel reduction thinning to overstocked stands. This information will be used to help inform a larger economic model for the region and the impacts of several policy measures including subsidizing biomass generation and max diameter cut limits will be analyzed.

Watson, Brett   (Poster #37)

Brett Watson Student Researcher Humboldt State University SAFE National Co-Chair 2008-2009

Wind-driven fire spread and flammability characteristics of eight northern California species

Wildfires are fueled by an inherent component of plants: flammability. Chemical and physical variation in litter may dampen or promote flammability resulting in differential flammability among species. Little work has united traditional metrics

of flammability with how fires spread in these fuels. Wind and slope increase spread rates, and in ecosystems dominated by vertical fuels (e.g., chaparral and many grasslands), sustained fire spread is hampered without wind. Wind can change fuel moisture by introducing drier air, as well as the rate of stored energy release by adding oxygen to the combustion process. Wind can also play an important role in determining vegetation patterns. Wind is clearly important to fire behavior and fuelbed flammability. Here we examine the wind-driven fire spread and flammability characteristics of eight northern California species.

Wells, Ashley   (Poster #1)

Ashley, an Idaho native, graduated from the University of Denver with a B.A. in Environmental Science. She is currently pursuing an M.S. in Natural Resources from the Department of Forest, Rangeland, and Fire Sciences at the University of Idaho. Working with Penelope Morgan, and with help from the NASA Extreme Fire Project, her research on fire history in the Selway Bitterroot Wilderness Area is focused on analyzing the changes in proportion of area burned severely and the spatial patterns of high severity patches through time. Ashley is most interested in researching post-fire vegetation regeneration in large, high severity patches from extensive fires in 2000.

Burn severity and vegetation response in the Selway-Bitterroot Wilderness Area, 1900-2007

Quantifying how the proportion of area burned severely has changed over time is critical to understanding trends in the ecological effects of fire. Most assessments over large areas are limited to 30 years of satellite data, while historical and contemporary fire return intervals are often longer. Although increases in wildfire extent and number of large fires are well documented, we know little about multidecadal trends in burn severity, patch size and implications for species diversity. We analyze the change in proportion of area burned severely across 542,747 ha in the Selway Bitterroot Wilderness Area in Idaho and Montana, USA using 30-meter fire perimeters and burn severities inferred from 1984-2007 satellite imagery from the Monitoring Trends in Burn Severity project and 1900-2000 aerial photography. We hypothesize that the proportion of area burned severely has increased over time. We also analyze field data that was collected from 20 sites burned in 2000, a year of widespread fires in the region, to quantify vegetation response within severely burned patches at 10 m, 40 m and 80 m distance from an unburned edge. We expect that as burn severity increases so will the patch size with implications for plant species diversity. We hypothesize that conifer seedlings will be less dense but that species diversity will not change as the distance from edge increases. Vegetation response has been found to be greatly impacted by burn severity and patch size, but the effect of patch size has not been widely studied and longer-term studies are needed. Understanding how proportion of area burned severely is changing over time, using a large spatial scale and long temporal scale, will help ecologists and land managers to better understand vegetation response post fire, and will help to inform predictions for future fire effects that may be extreme under changing climate conditions.

Whann, Alexandria   (Poster #27)

Alexandria Whann and Josh McCafferty, *University of Florida SAFE Chapter, 2012-2013*

The University of Florida chapter of SAFE is dedicated to informing Florida about the use of prescribed fire in many Southern ecosystems. We have co-hosted several local events, continued to aid students in obtaining fire certifications and conducted several prescribed burns. We hope to host more outreach events through the 2013 school year and establish a research plot at the school forest to further the group's understanding of Florida fire ecology.

Witter, Marti   (Poster #52)

Dr. Marti Witter has been the fire ecologist for the National Park Service's Mediterranean Coast Network since 2001. Marti's work focuses on using current fire science information about southern California shrublands to guide fire management practices in the three Mediterranean Coast parks, Channel Islands NP, Santa Monica Mountains NRA and Cabrillo NM. A major focus of her work is to find effective strategies to reduce fire threats to the local communities, while minimizing impacts to the natural resources of the park and surrounding open space areas. She works as Implementation Coordinator for the Central and Southern California Fire Science Consortium. Marti received a BS in Biology from UC, Irvine, a MS in Forestry from VPI&SU and a PhD from the University of Hawaii.

Fire effects in coastal sage scrub in Channel Islands National Park

Fire has frequently been proposed as a tool to control invasive species and restore native California grasslands and shrublands. In 1997 the Old Ranch prescribed burn was conducted on Santa Rosa Island to promote native shrub recovery

following cattle removal the year before. Fire was detrimental to coastal sage scrub recovery. Ten years after the burn, there was significant recovery of the dominant shrub, Artemisia californica (ARCA), in unburned transects. Cover increased an average of 195%, from 19% to 42%. In burned transects cover decreased an average of 18%, from 35% to 27%. There was no significant change in Artemisa density in the control plots so the increase in cover is attributed to individual plant growth, rather than recruitment of new individuals. Postfire data were also collected in coastal sage scrub following a 2006 14-acre wildfire on Santa Cruz Island. Artemisia mortality was high with resprouting rates of 0-9% among plots. ARCA seedling recruitment was 174:1 seedlings: resprouts in the first year post fire. Seedling recruitment in year 2 dropped to 1.6% the rate in year 1 and was absent in year 3. The endemic species Eriogonum grande (ERGR) was a strong facultative resprouter with 70% of plants resprouting. Seedling recruitment was 1:1 seedlings: resprouts in the first year but increased 270% in year 2 and was absent in year 3. Three years following the fire ARCA density in 4 of the 6 plots exceeded pre-fire densities, but only 2 of the six plots were dominated by native cover. High native cover was due to the presence of subshrubs such as Mimulus auriantiacus, Eriogonum grande, Lupinus albifrons and Lotus dendroides, while the remaining plots were dominated by non-native grasses. In recovering island scrub communities, fire, at a minimum, sets the demographic recovery clock backwards and facilitates the spread of non-native invasive species.

Wright, Clinton (Poster #114)

Clinton S. Wright, Research Forester, USFS - Pacific Wildland Fire Sciences Laboratory. Conducted research to document the relationship between volume and biomass for hand-constructed piles in the West. Paige C. Eagle, Database and Web Programmer, University of Washington - School of Environmental and Forest Sciences. Developed numerous user-friendly, web-based applications for natural resource management, including the Digital Photo Series, the Northwest and Alaska Fire Research Clearinghouse, and The Piled Biomass and Emissions Calculator.

The Piled Fuels Biomass and Emissions Calculator

Land managers throughout the West pile and burn surface fuels to mitigate fire hazard in dry forests. An estimate of the weight of the piled debris to be burned is necessary to assess potential smoke emissions and air quality impacts associated with this practice. Research to characterize the biomass present in machine- and hand-constructed piles was incorporated into a calculation tool for use by fire, fuel, and air quality managers. The Piled Fuels Biomass and Emissions Calculator is a simple-to-use, web application that uses the formulas for different geometric shapes to estimate pile volume, and empirically-derived relationships between volume and biomass to estimate pile weight for different piles types (machine vs. hand) composed of different material (different types of coniferous material for machine piles, and coniferous vs. hardwood/shrub material for hand piles). Emissions (PM, PM10, PM2.5, CO, CO2, CH4, and non-methane hydrocarbons) are estimated by calculating the consumable tonnage and multiplying by a fire-averaged emission factor. Input data can be entered manually through the graphical user interface or in a batch mode by uploading a properly formatted text file. Data inputs and calculation results are available within the user interface and also in a downloadable format. The Pile Calculator is executed by using standard web browser software (e.g., Microsoft Internet Explorer, Mozilla Firefox, etc.) so no software installation is necessary, and users will always have the most up to date version for use at their disposal.

Wright, Clinton (Poster #115)

Measuring the effects of slash pile burning and how fire effects change as piles age

Typical hazardous fuel reduction treatments target small diameter trees for removal producing large amounts of woody material, much of which is piled and burned on site. Little is known about how physical characteristics and the environmental conditions under which piles are burned affects atmospheric emissions, carbon pools and fluxes, soils, and vegetation. We are conducting experimental pile burns in the Pacific Northwest (Okanogan-Wenatchee National Forest) and the Southwest (Santa Clara Pueblo) to provide managers in these regions with new information documenting the effects of burning piles of increasing age under different environmental conditions. Specifically we are measuring combustion rate and duration, fuel consumption, charcoal production, burn intensity (above and below ground heat fluxes), changes in soil properties (nutrient levels and hydrophobicity), adjacent tree damage, surface vegetation responses, and changes in invasive species prevalence after pile burning. We are burning piles at six-month intervals to test the effects on the above-listed measures of increasing pile age (0, 0.5, 1, 1.5, and 2 years since piling) under two different seasons (spring vs. fall). Providing fuel and fire practitioners with detailed, quantitative information about the effects of pile burning will inform key management decisions about when to burn and how to minimize potential negative emissions, soil, carbon, and vegetation impacts.

Wright, Vita (Poster #111)

A social science analyst specializing in fire science application, Vita Wright works in a shared position between the Rocky Mountain Research Station (RMRS) Human Factors & Risk Management RD&A and the NPS Branch of Wildland Fire. Her research focused on individual and organizational influences to the success of fire science delivery. Vita currently serves as PI for the Northern Rockies Fire Science Network. Prior to that, she developed the Aldo Leopold Wilderness Research Institute's Research Application Program. Both efforts aim to improve the communication of scientific information between scientists and managers by increasing accessibility to scientific tools and knowledge.

The Northern Rockies Fire Science Network—Enhancing science delivery and application

Effective science communication is critical to science-informed management. Despite the rich history of fire research, fire and fuels managers struggle to sort through available scientific information; find the right tools, models, and applications to make management decisions; and access expertise relevant to fire and fuels management questions. Sponsored by the Joint Fire Science Program, the Northern Rockies Fire Science Network (NRFSN) is being developed as part of a national knowledge exchange network that enhances fire science delivery and application. The NRFSN is working to become the go-to resource for reliable, relevant, and timely information to meet the needs of managers and scientists involved in fire and fuels management in Rocky Mountain forests of north and southeast Idaho, western Montana, and northwest Wyoming. To ensure that NRFSN activities are responsive to the needs of managers, the NRFSN gathered feedback using a survey and focus groups of approximately 200 managers and decision makers in the Northern Rockies. Respondents were asked about obstacles to using research, methods used to access research, research topics for which they need better access, and priority NRFSN activities. Based on the needs assessment results, the NRFSN helps managers access the latest knowledge and tools that support fire and fuels management through an electronic newsletter, a web portal that links to Northern Rockies relevant fire science resources, and research briefs and syntheses of key topics in fire and fuels management. The NRFSN also identifies and communicates regional research priorities to scientists, and organizes workshops and fieldtrips to build and strengthen relationships among managers and scientists in the region. This poster describes NRFSN goals, summarizes needs assessment results, and provides examples of NRFSN activities.

Wyatt, Katherine (Poster #6)

Katherine Hoglund Wyatt is a second year graduate student at the School for Environmental and Forest Sciences, University of Washington. She focuses on riparian fire ecology, but remains engaged in forest ecology throughout the Pacific Northwest. Building on her professional experience in collaborative conservation and academic experience in ecology, she hopes to continue to do field research and work collaboratively with governmental and nonprofit partners.

Riparian vegetation and water quality changes in response to prescribed fire on the east side of the Cascades, Washington.

Quantifying vegetation and water quality response to fire severity within riparian corridors is paramount to understanding and managing these sensitive ecosystems. Across a landscape, riparian areas connect upland to lowland habitats and aquatic to terrestrial ecosystems. They disproportionately contribute to landscape diversity and heterogeneity (Naiman and Décamps 1997). Riparian vegetation and deciduous vegetation in particular protects water quality for fish and other aquatic species by filtering sediment, regulating temperature, stabilizing stream banks and providing large woody debris (Liquori and Jackson 2001, Wissmar 2004). In the Nile Creek Watershed in the Okanagan-Wenatchee National Forest on the east side of the Cascades, Washington active fire suppression has reduced the frequency and size of fires (Everett et al. 2003). Dendrochronology work from the east-slope of the Cascade Mountains suggests that fire historically maintained riparian vegetation, by promoting fire resistant, early successional, and deciduous species (Camp et al. 1997, Everett et al. 2003, Messier et al. 2011). In an effort to restore the riparian and aquatic integrity and to reduce fuel loads, a prescribed fire was completed in summer of 2012. The primary objective of this study was to determine the effect of fire severity on riparian vegetation. In addition, I sought evaluate the effect of the prescribed fire on fuel loads and water quality. To meet these objectives I established 100m transects beginning at bank-full height, running perpendicular to Nile Creek in the spring of 2012. I scored fire severity along each transect based on percent soil scorch and percent crown scorch. I determined fuel loads using Brown's fuel transects. Along each transect, I quantified shrub and overstory species composition and abundance before and after the fire. I monitored water quality throughout the summer with data loggers installed along Nile Creek and in a neighboring creek unaffected by fire.