ABSTRACTS OF POSTER PRESENTATIONS

Abstracts for poster presentations are listed alphabetically, by presenting author's last name. Abstracts appear unmodified, as submitted by the corresponding authors. The number appearing before the name corresponds to the placement of the presentation in the floorplan.

401 **Arizpe, Alexis** (University of Arizona), alexisa@email.arizona.edu

Alexis Arizpe (University of Arizona), Don Falk (University of Arizona)

Fire History in Gallery Forests of Southern Arizona and Northern Sonora

Fire-scarred tree-ring partial cross sections were collected from gallery forests in Southeastern Arizona and Northeastern Sonora. The sites, Rattlesnake Canyon in the Galiuro Mountains of Arizona and Cajon Bonito in the Sierra San Luis, Sonora, Mexico share several important characteristics relevant to fire regimes, namely plant communities and climate regimes. A number of important distinctions are also noted between sites including land ownership and management practices. A lack of organized fire suppression in the Sierra San Luis allows reconstruction of 20th century fire patterns not typically available in the United States. Collections from each site were analyzed independently to determine mean fire interval, fire seasonality, and fire synchrony within the forest. In addition, sites were compared to determine fire synchrony across independent sites.

402 **Balice, Randy** (Los Alamos National Laboratory), balice@lanl.gov

Randy Balice (Los Alamos National Laboratory), Brian Oswald (Stephen F. Austin State University), Sean Dugan (Stephen F. Austin State University)

Changing fire hazards in response to ponderosa pine drought mortality

The Los Alamos region experienced a protracted drought, associated with elevated temperatures, beginning in 1996 and continuing with only sporadic relief until 2004. This drought had a profound impact on the local vegetation. Nearly 98 percent of piñon, greater than ten feet tall, were killed, beginning in 2002. The drought also affected ponderosa pine, with approximately 14 percent of the trees succumbing to the drought conditions by 2005. During this time period, significant mortality occurred in all size classes of ponderosa pine. On the other hand, stands that had been thinned to the local thinning target of 50 to 150 trees per acre experienced very little drought mortality. To determine if drought mortality was an effective hazard-reduction process, we analyzed the canopy cover of unthinned, but drought-mortality impacted, ponderosa pine stands, from 1997 to 2005. We found that the percent overstory canopy cover of ponderosa pine forests decreased, in a fairly linear fashion, from 80.7 percent in 1997 and 81.6 percent in 1998 to 62.8 percent in 2005. The final canopy cover levels in 2005 approached the thinning target, which had been established at 40 to 60 percent. The

implication is that drought mortality was effective in thinning ponderosa pine forests and reducing at least one indicator of fire hazards to nearly desirable levels.

403 **Banwell, Erin** (Sonoma Technology, Inc.), ebanwell@sonomatech.com

J. Morgan Varner (Humboldt State Univeristy)

Flammability of North America Pines

We evaluated burning characteristics and physical leaf characteristics of 33 pine species collected throughout North America. Pinus species are important components of fire-prone and fire-driven ecosystems throughout the northern hemisphere, and their litter is a driver of surface, ground, and canopy fire behavior. In spite of the assumptions related to pine flammability, little data are available that quantify variations among species, and no substantive work addresses the underlying mechanisms of these differences. For each pine species, seven 15 g replicates were burned under controlled laboratory conditions. Average fuelbed height (cm), maximum flame height (cm), flaming duration (sec), smoldering duration (sec), and residual mass (g) were measured. These metrics were combined in a Principal Component Analysis that explained approximately 80% of the variation in flammability. At the time of each burn, moisture content of the litter was less than 3%. Leaf length, leaf thickness, and weight of fascicle were measured for each pine species collected. Among species burned, P. serotina, P. rigida, and P. washoensis burned with greatest intensity, generating the longest average maximum flame heights (mean = 87.2, 85.6, and 84.9 cm, respectively). P. balfouriana, P. longevea, and P. monophylla burned with the shortest average maximum flame heights (mean = 20.4, 25.7, and 28.1 cm, respectively). Among the physical needle traits measured, only needle length was related to flammability in a piece-wise relationship (R-squared = 0.65). Future work on pine flammability should evaluate the role of chemical variability among species.

404 **Battaglia, Mike** (USFS Rocky Mountain Research Station), mbattaglia@fs.fed.us

Mike Battaglia (USFS Rocky Mountain Research Station), Katherine Cueno (Colorado State University), Chuck Rhoades (USFS Rocky Mountain Research Station), Paula Fornwalt (USFS Rocky Mountain Research Station)

Mastication effects on fuels, plants, and soils in four western U.S. ecosystems: trends with time-since-treatment

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 will combine 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.

405 **Bunn, Windy** (National Park Service), Windy_Bunn@nps.gov

Windy Bunn (National Park Service), Eric Gdula (National Park Service), Michael Kearsley (National Park Service)

Using fire progressions and burn severity data to understand and manage contemporary mixed-severity fire regimes

Understanding and managing mixed-severity fire regimes is a challenge for contemporary land managers who balance the goals of restoring and maintaining natural ecosystem processes with the goals of protecting threatened species and preserving forests for recreation and other human values. Each year in the North Rim area of Grand Canyon National Park, managers must decide whether to allow lightning-ignited wildfires to burn the mixed-conifer forest or to suppress these fires. Decades of fire suppression in these forests have altered the mixed-severity mosaic of forest structure such that large patches of high severity fire that could negatively impact other park values become possible. To better understand the conditions under which large patches of high severity fire have been generated in the mixed-conifer forest over the past 10 years and to help predict when they might occur in the future, we compiled data from previous wildfires in this area. These fires all burned in mixed conifer forests for 20 or more days, had records of daily fire progressions, and had Monitoring Trends in Burn Severity (MTBS) one-year post burn severity data. We combined the daily progression and MTBS severity data with weather variables retrieved from the nearest RAWS stations to determine which weather variables predicted days that included larger patches of high severity fire. Knowing which weather variables are most important for generating large patches of high severity fire on the local landscape will improve the park's wildfire decision-making process.

406 **Drury, Stacy** (Sonoma Technology, Inc.), sdrury@sonomatech.com

Miriam Rorig (USDA Forest Service), Kenneth Craig (Sonoma Technology, Inc.), Neil Wheeler (Sonoma Technology, Inc.), Scott Strenfel (Pacific Gas & Electric)

Uncertainty in Model-Generated Fire Weather Values: How Does Model Variability Influence the Reliability of Dry Thunderstorm Risk and Ignition Potential Predictions?

Every year lightning causes numerous wildfires throughout the conterminous United States and Alaska. In previous work, we developed an algorithm to determine the risk of dry thunderstorms, and we applied this methodology using output variables from the Penn State/National Center for Atmospheric Research (NCAR) mesoscale model (MM5) to produce a predictive scheme for estimating the risk of "dry" lightning in the western United States. We found a significant correlation between high probabilities of dry lightning risk and fire ignitions. We are currently working on a project to include a measure of uncertainty in the model-generated meteorological variables used to assess fire danger, and to expand the dry lightning algorithm to incorporate fuels information into our predictions of dry lightning outbreaks. We are also expanding the predictions to incorporate the latest regional- and national-scale models. This expansion will enable us to produce new forecast products that predict the risk of sustained fire ignitions from dry thunderstorm outbreaks. We will present the latest results from these efforts.

407 **Edwards, John** (Sul Ross State University), jedwards3@sulross.edu

John Edwards (Sul Ross State University), Bonnie Warnock (Sul Ross State University)

Small Mammal and Vegetative Response to Wildfire in the Trans-Pecos, Texas

Fire has been an important factor in maintaining the health and integrity of semi-arid grasslands in the Trans-Pecos for centuries. Along with grazing, fire has recently been used as a tool to promote the diversity and quality of vegetation by landowners. The responses of both the vegetation and small mammal community to wildfire, along with cattle grazing impacts, will be assessed in a semi-arid grassland in the Trans-Pecos. Pre-burn data was collected between September 2010 and March 2011 along transects established within representative ecological sites for vegetative cover, plant species and small mammal species presence. Post-burn data will be collected through fall 2012 on vegetation, small mammals, precipitation, and grazing. Pre-burn data of mean basal cover of perennial grasses by ecological site were: 15.3% for the Igneous Hill and Mountain Mixed Prairie, 25.5% for the Loamy Mixed Prairie, and 22.3% for the Shallow Mixed Prairie. During pre-fire monitoring of small mammals, 21 specimens comprising 7 different species were collected over 1350 trap-nights. Monitoring conducted 2-3 months post-fire resulted in 13 specimens of 5 species being collected in 1620 trap-nights. A burn assessment of the 36 vegetation transects indicated that the percentage of transects burned was 25 at 100%, 6 at between 80% and 100 %, 1 at 31%, and 4 at 0%. The recovery time of the landscape will rely highly on precipitation and other ecological factors like grazing. Knowing

how these factors respond to fire will give us a more complete and accurate assessment of a landscape's return to full health following a fire.

408 **Fallon, Jaclynn** (Northern Arizona University), jf345@nau.edu

Jaclynn Fallon (Northern Arizona University), Yeon-Su Kim (Northern Arizona University), Andi Thode (Northern Arizona University), Vita Wright (United States Forest Service)

Science Communication in the Southwest Fire Science Consortium

Bridging the gap between scientific research and practical usage is one of the greatest challenges facing scientists and managers today. How quickly, and how likely, scientific research is to be accepted as common knowledge and practice often depends on how the information is transmitted. Scientific information and innovations are more likely to be adopted if they are discovered through trustworthy sources and informal social networks. The role and importance of trust and informal social networks for knowledge sharing is widely recognized in the Business and Management literature, but has been sparsely applied to Natural Resource Management. Using social network theory, we propose to identify communication channels between fire scientists, fire managers, and fire practitioners in the Southwest Fire Science Consortium. We will survey a random sample of fire managers and other fire staff in five federal fire management agencies about who they talk to about fire science information, and why. The Southwest Fire Science Consortium is a Joint Fire Science Program funded organization whose aim is to increase interagency collaboration and streamline the distribution of fire science information throughout the geographic region of the Southwest. By understanding the underlying communication channels and motivations for scientific knowledge sharing, the Consortium can identify areas in the communication stream that are either hindering, or could potentially accelerate information dissemination.

409 **Ford, Paulette** (USDA Forest Service), plford@fs.fed.us

Paulette Ford (USDA Forest service)

Effects of Prescribed Fire on Black-tailed Prairie Dog Colonies in Shortgrass Steppe

Black-tailed prairie dogs once ranged from Canada to Mexico throughout the Great Plains and west to Arizona. During the last 100 years, public and private control programs, plague, and habitat loss have reduced the distribution of black-tailed prairie dog populations by 98 percent, causing localized extinctions. Black-tailed prairie dogs significantly alter grassland ecosystems and are considered a "keystone" species. Experimental research, located on the Kiowa National Grassland in northeastern New Mexico, examines the response of black-tailed prairie dog colonies to fire in the growing vs. dormant season at return intervals of 3, 6 and 9 years in shortgrass steppe. The Kiowa and Rita Blanca National Grassland is receiving consideration as a proposed release site for the black-footed ferret. However, prairie dog populations are not

currently extensive enough to support a release. Research on the effects of season and frequency of prescribed fire on the colonies will help with the National Grassland's ability to develop strategies to use prescribed fire as a tool to increase populations. The persistence of other species inhabiting shortgrass steppe are dependent on black-tailed prairie dogs to varying degrees, including the black-footed ferret (federally endangered), burrowing owl, swift fox, mountain plover, golden eagle, and ferruginous hawk. Data from this research has the potential to help to return the black-footed ferret to a part of its historic range by providing data needed to make informed management decisions, and to develop site specific recovery plans for both the ferret and the prairie dog. Preliminary results will be discussed.

410 **Fornwalt, Paula** (USDA Forest Service), pfornwalt@fs.fed.us

Paula Fornwalt (USDA Forest Service)

The roles of smoke and heat in the germination of 24 Colorado Front Range plant species

Recent research conducted in fire-dependent ecosystems of Australia, South America, and elsewhere has shown that fire cues such as heat shock or smoke can enhance germination for some understory plant species. However, such research is limited for Rocky Mountain understory plant species, and is particularly scarce for species occurring in the understories of Front Range ponderosa pine forests. Thus, we utilized a two-factor experiment with eight treatments – two levels of smoke (smoked or not smoked) and four levels of heat (no heat, 60, 90, or 120C) – to investigate the influence of smoke and heat on the germination 24 Front Range species. The species chosen were all observed to increase in abundance following the 2002 Hayman Fire, Colorado. Heat treatments were applied by heating seeds for five minutes in an oven pre-heated to the appropriate temperature. Smoke treatments were applied following the heat treatment by soaking seeds for 12 hours in a smoke-water solution; seeds not receiving the smoke treatment were soaked in water. Germination was monitored by placing seeds in an incubator and counting the number of germinants every 1 to 3 days for 30 to 60 days. An analysis of variance is currently being conducted to examine the influence of smoke and heat treatments on total seed germination and on the time required to achieve 50% germination. Preliminary results suggest that many of the 24 species tested responded positively to smoke and/or heat cues.

411 **Fowler, James** (US Forest Service), jffowler@fs.fed.us

James Fowler (US Forest Service), Linda Wadleigh (US Forest Service), Carolyn Seig (US Forest Service)

Post-fire tree mortality can be accurately predicted with two variables

Previous research has shown that crown scorch volume and crown consumption volume are the major predictors of post-fire mortality in ponderosa pine. In this study, we use postfire

estimates of crown scorch (brown needles) and consumption (consumed needles and fascicles) measured to the nearest 5% (by viewing up to three sides of each tree) from 6633 trees in five wildfires from the Intermountain West. We then use piecewise logistic regression models of crown scorch data to locate a mortality threshold at 88% scorch by volume for trees with no crown consumption. For trees with more than 40% crown consumption volume, mortality is greater than 85%. For trees with crown consumption volume from 5-40%, there is an increasing probability of mortality with increasing crown scorch. Analysis of an independent 600+ tree dataset from Colorado produced similar results. This analysis indicates that for trees with postfire crown damage, death can be predicted if 1) crown scorch volume is greater than 85%, 2) crown consumption volume is greater than 40%, or 3) for trees with crown consumption between 5 and 40% and crown scorch volume greater than 50%. Given the ease of estimating these two variables and the accuracy of using them to predict mortality of ponderosa pine, this method shows promise for quickly and accurately predicting which trees are most likely to die after sustaining fire damage.

412 **Gaetani, Maria** (Texas Tech University), ms.gaetani@ttu.edu

Maria Gaetani (Texas Tech University), Dylan Schwilk (Texas Tech University)

Tradeoffs in fire survival strategies in southwestern oaks

The Sky Islands of the American Southwest exist under unique geographic and climatic conditions which support diverse vegetation and fire regimes. Developing our understanding of fire survival strategies of Southwestern oaks will allow us to address possible changes in community composition locally, as well as address a gap in the global understanding of fire survival strategies. This study focused on tradeoffs in fire survival strategies (sprouting and non-sprouting) in the common oaks of the Trans-Pecos Mountains (Q. emoryi, Q. gambelii, Q. gravesii, Q. grisea, Q. hypoleucoides, Q. muehlenbergii, Q. pungens, Q. rugosa) in three study sites: the Chisos Mountains, the Davis Mountains and the Guadalupe Mountains. Total nonstructural carbohydrate reserves served as a proxy for ability to post-fire sprout and bark thickness was used as an indicator of investment in a non-sprouting survival mechanism. Oak trees may not invest in either strategy early in development; however we expect overall investment in survival strategies to increase as trees mature. Furthermore, as trees grow, the tradeoff between the alternate modes of survival will become more apparent. These strategies can be included with other functional traits when determining species success or failure under intensifying disturbance regimes. Applying a deeper understanding of fire survival strategies allows private and public agencies to promote better fire management practices.

413 **Grauel, William** (San Carlos Apache Tribe), bgrauel@forestry.scat-nsn.gov

William Grauel (San Carlos Apache Tribe)

Modeling Hazardous Fuel Treament Longevity

Downed woody debris accumulation following a simulated prescribed burn was modeled using the Forest Vegetation Simulator and Fire and Fuels Extension. In FVS/FFE, fire behavior and fuel moisture were adjusted until post-burn fuel loads immediately after the fire closely approximated actual fuel loading measured after an intense surface prescribed fire in low-elevation ponderosa pine forest in southeast Arizona. Coarse woody debris fuel loads rebounded rapidly while fine woody debris remained below pre-burn levels for decades. The large increases in coarse woody debris are a result of post-burn tree mortality following the simulated fire. Subsequent re-measurements of these plots will help to calibrate widely-used but rarely-validated post burn tree mortality models.

414 **Hawkes, Brad** (Natural Resources Canada, Canadian Forest Service), bhawkes@nrcan.gc.ca

Brad Hawkes (Pacific Forestry Centre)

Changes in Fire Severity after Multiple Bark Beetle Outbreaks

The mountain pine beetle has affected an estimated 17.5 million hectares of lodgepole pine forest since the mid 1990s, affecting economies and livelihoods all over British Columbia. Most of the dead pine trees have lost their needles and are in the “grey” stage of post-beetle crown fuel condition. Fire managers have been observing wildfires in terms of the influence of beetle induced mortality on fire behavior and severity but little quantitative information is available. The 2009 Lava Canyon wildfire in the Chilcotin plateau burned over 60,000 ha of lodgepole pine forest impacted by the 1980s and current mountain pine beetle outbreaks. Long-term stand dynamic plots, established after the 1980s outbreak, have been re-measured in 2001 and 2008. The wildfire burned over 9 plots providing fuel consumption data for the forest floor, surface fine and coarse woody debris, tree boles and crowns. The Lava Canyon wildfire burned the plots as a crown fire with an observed rate of spread of 18 m/min. Forest floor consumption averaged 88% of pre-burn depth. Fine and coarse woody fuel consumption averaged 99% and 79% of pre-burn load, respectively. Fire intensity will be estimated based on the recorded fuel consumption and the observed rate-of-spread. The observed rate-of-spread and fire intensity will be compared to those predicted by the Canadian Fire Behaviour prediction system for green lodgepole pine forests.

415 **Kitchen, Stanley** (USDA Forest Service), skitchen@fs.fed.us, 801-356-5108

Stanley G Kitchen (USDA Forest Service), Steven L Petersen (Brigham Young University), Sam St.Clair (Brigham Young University)

Mixed Aspen-Conifer Post-Fire Succession: the Twitchell Canyon Fire as a Long-term, Variable Severity Case Study

Post-fire succession for mixed aspen-conifer landscapes of the North American West is poorly understood, thus studies that examine vegetation patterns across a range of fire severity classes are needed. In 2010, the Twitchell Canyon Fire burned 18,160 ha on the Tushar Mountains in southwest Utah. The fire burned for 90 days, creating a spatially-variable burn severity mosaic. Fire severity was estimated at 20, 34, and 33 percent for low, moderate and high severity, respectively. In 2011 we measured vegetation attributes on 47 permanent plots. Plots were randomly located within 1,600 m of usable roads and stratified by forest type and burn severity using GIS-based data layers. Attributes were measured for all trees within 15 m of plot centers (0.07 ha). Within each plot, understory species frequency and aspen shoot density were determined using three circular subplots (0.0064 ha). Across all forest types, low, moderate and high frequency fire caused 36, 65, and 100 percent first-year mortality of mature (min. dbh 10 cm) live trees, respectively. Mean post-fire densities were 435 and 171 live trees per ha for low and moderate burn severity classes. Aspen shoots were counted on 38 of 47 plots. Across all plots, mean shoot density was 20,193 per ha. As expected, the understory was dominated by root sprouters and disturbance-adapted herbs. Conifer seedlings were common but not abundant. We anticipate that in time this study will inform improved trajectory and rate predictions for post-fire succession in mixed aspen-conifer communities of the North American West.

416 **Kuchinke, Diana** (University of Ballarat), diana@kuchinke.com.au

Diana Kuchinke (University of Ballarat)

A proposal to investigate the effects of increasing levels of bushfire frequency on threatened woodland birds.

Victoria Australia, with its unique meteorological and biophysical arrangement, is internationally regarded as being one of the most bushfire prone parts of the world. 7 February 2009 wildfire events, whilst not unprecedented, created widespread devastation and greatly affected many people. A subsequent Royal Commission Inquiry recommended that the State implement a program of prescribed burning with a rolling target of 5 percent of public land, effectively doubling the level of prescribed burning annually and irrespective of any wildfire events. The current Government has stated it will follow all recommendations. This may have major repercussions for biodiversity. Woodland bird species in southeastern Australia are declining. Already negatively impacted by urban development, the effects of climate change on fire regimes are likely to further impact on avifauna. Currently, fire planning holds the view that 'has plants birds will come' or that 'pyrodiversity begets biodiversity' yet few studies have

quantified the effects of increasing fire frequency on avifauna. It could be expected that increasing fire frequency would change the species composition and structure of vegetation, which may in turn affect food and nesting site availability for birds. This project will survey bird populations in Victorian dry forests and woodlands. The survey will test predictions of the impact of fire on birds and their habitats using sites with different fire histories, including time since fire, fire type (planned versus wildfire), as well as pre- and post-burn comparisons.

417 **Leonard, Jackson** (USFS Rocky Mountain Research Station), jleonard@fs.fed.us

Jackson Leonard (USFS Rocky Mountain Research Station), Hugo Magana (USFS Rocky Mountain Research Station)

Using Aquatic Invertebrate Populations to Access Recovery 20 Years After Wildfire

We examined how aquatic invertebrate populations recover after high severity wildfire across a 20 year time period. Literature regarding the long-term impacts of wildfire on aquatic systems in the southwestern U.S. is limited. Heating and subsequent flooding events can have profound impacts on the function of these systems. We compared water quality and aquatic invertebrate populations across 6 first order stream systems, which had burned at 1 and 20 year time periods. Three patterns emerged. 1) Aquatic invertebrate populations were higher in unburned streams compared to streams that were impacted by wildfire up to 20 years prior 2) Caddisfly (Trichioptera) populations were more abundant in unburned streams compared to fire impacted streams 3) % saturated oxygen levels in burned streams were nearly twice as high as % saturated oxygen levels in unburned streams. These results demonstrate that significant, fire induced changes to aquatic systems, can be observed more than 20 years after the fire event.

418 **Minor, Jesse** (University of Arizona), jminor@email.arizona.edu

Donald Falk (University of Arizona)

Spatio-temporal analysis of fire regimes in a Madrean Sky Island in southeastern Arizona

A network of fire-scar collections from the Chiricahua Mountains is used to create a spatially explicit reconstruction of fire regimes across a suite of topographic variables and vegetation types. This network of fire-scars is used to test fire synchrony among canyons and to reconstruct historical fire perimeters. Spatial features of reconstructed fire regimes are then compared with more contemporary mapped and remotely sensed burn severity, including the 2011 Horseshoe 2 fire. Spatial and temporal analysis of burn severity across topographic variables and vegetation types demonstrates that the time since last burn significantly affects the severity of fire in areas that reburn. Understanding historical fire sizes and fire regimes, as well as contemporary fire intensity as it operates in a mosaic of vegetation types and

topographic settings and previously burned areas will aid land managers in restoring fire as an ecosystem process in Madrean Sky Island settings.

419 **Rhodes, Edward** (Center for Natural Resource Information Technology), erhodes@cnrit.tamu.edu

William Shaw (Texas AgriLife Research), Jay Angerer (Texas AgriLife Research), R Loren Naylor (Texas AgriLife Research), Doug Tolleson (University of Arizona), Wayne Hamilton (Texas A&M), J. Richard Conner (Texas A&M)

Near real-time characterization and modeling of non-forested vegetation and fueldbed growth dynamics with the Phytomass Growth Simulator (PHYGROW) and Burning Risk Advisory Support System (BRASS)

The threat of wildfire in non-forested regions is directly related to the condition of weather and vegetation variables within an ecological community. Fine herbaceous fuels contribute greatly to the outcome of a fire event. However, when compared to the modeling and mapping procedures used in forested and other ecosystems, scientific knowledge in the characterization of non-forested fuels is lacking. The need to accurately evaluate and model non-forested fuels is increasing as public expectations for quantitative risk assessments grow. Development of more reliable mapping and modeling tools, as well as a greater understanding of post-fire plant community succession, would allow land managers to more effectively assess and execute wild and prescribed fire plans and rate fire danger in non-forested areas. The Burning Risk Advisory Support System (BRASS) employs the PHYGROW simulation model to “grow” the non-forested vegetation (fuel) on a near real-time basis. In addition, it provides estimates of current live herbaceous/live wood moisture, standing crop, and live wood production. By combining outputs from PHYGROW with NOAA daily weather data, BRASS is able to construct a 7-day forecast of local burning conditions updated at 6 hour intervals. Once calibrated to an area, the system is capable of providing fire resource managers with a visualization of non-forested fuel production and moisture, 30-minute burn area, spread rate, flame length, forecasted temperature and rainfall from anywhere with an internet connection. These data can then be used to aid in fire resource management decisions.

420 **Ribe, Tom** (Firefighters United for Safety, Ethics, and Ecology (FUSEE)), tribe@swadventures.com

Tom Ribe (Firefighters United for Safety, Ethics, and Ecology (FUSEE)), Timothy Ingalsbee (Firefighters United for Safety, Ethics, and Ecology (FUSEE))

Torchbearers for a New Fire Management Paradigm: Firefighters United for Safety, Ethics, and Ecology (FUSEE)

Firefighters United for Safety, Ethics, and Ecology (FUSEE) is a nonprofit organization promoting safe, ethical, ecological wildland fire management. FUSEE believes firefighter and community safety are ultimately interdependent with ethical public service, wildlands protection, and ecological restoration of fire-adapted ecosystems. Our 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 function 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 protect fire-affected wildlands, restore fire-adapted ecosystems, and 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. 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 into community fire preparation; recreating fire-compatible communities and restoring fire-permeable landscapes.

421 **Rundall, Jill** (Northern Arizona University), Jill.Rundall@nau.edu

Jill Rundall (Northern Arizona University), Ariel Leonard (Kaibab National Forest), Valerie Stein Foster (Kaibab National Forest), Thomas Sisk (Northern Arizona University)

Landscape-level NEPA: Benefits of Advanced Technologies, Spatial Analysis and Collaborative Science

The National Environmental Policy Act (NEPA), enacted in 1970, mandates environmental assessment, disclosure and public input on virtually all proposed major federal actions regarding land us and natural resource management. In 2010, the White House Council on Environmental Quality (CEQ) proposed to "modernize and reinvigorate" NEPA to reflect forty years of practical experience, and to capture scientific and technological developments that enable powerful new approaches to environmental analysis. Geographic information systems (GIS) and remote sensing – coupled with spatial analysis and modeling – make landscape-scale analysis and planning a powerful and cost-effective alternative to traditional approaches developed decades ago. Using advanced GIS and remote sensing techniques developed in response to increasingly sophisticated collaborative groups, the Lab of Landscape Ecology and

Conservation Biology (LLECB) has supported stakeholders (public, private and agency) in several assessments of forested landscapes and restoration plans in Arizona and New Mexico. We present multi-scaled analyses from these assessments that have been tested in practice and, if adopted in formal NEPA analysis, might increase time and cost efficiencies. Results from these public efforts have identified priority areas for management and suggested actions that are scientifically grounded and reflect a high level of public deliberation and received widespread support. Using these or similar approaches, land managers can work with stakeholders through all stages of the NEPA process, to identify needs, develop proposed action, share information, assess landscape impacts, including cumulative effects and inform the selection of alternatives.

422 **Scudieri, Catherine** (US Forest Service), cscudieri@gmail.com

Catherine Scudieri (US Forest Service), Carolyn Hull Sieg (US Forest Service), Andrea Thode (Northern Arizona University), Sally Haase (US Forest Service)

Understory vegetation response after 30 years of interval prescribed burning in two ponderosa pine sites in northern Arizona

Southwestern ponderosa pine (Pinus ponderosa C. Lawson var. scopulorum Engelm.) forests evolved with frequent surface fires and have changed dramatically over the last century. Overstory tree density has sharply increased while abundance of understory vegetation has declined primarily due to the near cessation of fires. We examined effects of varying fire-return intervals (1, 2, 4, 6, 8, and 10 years, plus unburned) on the abundance and composition of understory vegetation in 2007 and 2008 after 30 plus years of fall prescribed burning at two ponderosa pine sites. We found that after 30 years, overstory canopy cover remained high, while understory plant canopy cover was low, averaging <12 percent on all burn intervals. We attributed the weak understory response to a few factors – the most important of which was the high overstory cover at both sites. Graminoid cover and cover of the major grass species, Elymus elymoides (squirreltail), increased on shorter fire-return intervals compared to unburned plots, but only at one site. Community composition differed significantly between shorter fire-return intervals and unburned plots at one site, but not the other. For several response variables, precipitation levels appeared to have a stronger effect than treatments. Our findings suggest that low-severity burn treatments in southwestern ponderosa pine forests, especially those that do not decrease overstory cover, are minimally effective in increasing understory plant cover. Thinning of these dense forests along with prescribed burning is necessary to increase cover of understory vegetation.

423 **Smith, Kendall** (Sul Ross State University), ksmith2@sulross.edu

Kendall Smith (Sul Ross State University), Bonnie Warnock (Sul Ross State University), Louis Harveson (Sul Ross State University), Patricia Harveson (Sul Ross State Univeristy)

Effects of Prescribed Fire on Pronghorn Habitat in Desert Grassland Communities in the Trans-Pecos

The Trans-Pecos region of Texas has had naturally occurring wildfires long before European civilization. The first Europeans to enter the Trans-Pecos inadvertently suppressed wildfire through grazing. This was one factor that contributed to an overall vegetation change from predominantly grassland to shrub-land in many areas. This change has had a negative effect on some native species including pronghorn (Antilocapra americana). Fire can be used to accomplish many objectives including: increasing production of forage and browse; suppression of many brush and cacti species; controlling selected forbs and grass species; improving herbaceous composition; increasing availability of forage and browse; improving forage quality and quantity; improving nutrient cycling; increasing animal production; and removing certain mulch and debris. I am currently evaluating the effects of fire on pronghorn habitat in areas that have burned between 1 to 5 years ago and areas that have not been burned for over 50 years in Brewster County, Texas. Preliminary results from the first two field seasons suggest fire decreases whitebrush (Aloysia gratissima) cover for approximately 2 years post treatment. Mature western honey mesquite (Prosopis glandulosa var. torreyana) sprouts vigorously after fire. Forb species richness displays an initial short duration increase post treatment, after which grasses become the primary herbaceous species. Samples of forb species were collected and will be analyzed for nutritional quality. This and future research will give land owners the knowledge needed to use fire as a viable management tool that will provide quality habitat and forage for wildlife and livestock, within the Trans-Pecos region.

424 **Strand, Eva** (University of Idaho / NIFTT), evas@uidaho.edu

Jeff Jones (US Forest Service), Eva Strand (University of Idaho / NIFTT), Kathy Schon (University of Idaho/NIFTT)

Fire Behavior, Fire Effects, and Fire Regimes – Tools and Training Resources

Technological advances in the area of fuel and wildland fire management have created a need for decision support tools and effective training in the use of these tools and technologies. The National Interagency Fuels Coordination Group has chartered a team of professionals to develop science-based fire and fuels assessment tools, and to provide online training and technology transfer, to help managers implement fuels, fire, and vegetation management technology for fire risk mitigation and ecosystem restoration. The team is called the National Interagency Fuels, Fire, and Vegetation Technology Transfer (NIFTT). NIFTT has created and maintains seven GIS tools and have developed user resources for these tools, including user's guides and tutorials. The learning tools include the Fire Regime Condition Class Mapping Tool, Wildland Fire Assessment Tool, LANDFIRE Data Access Tool, Area Change Tool, and the

LANDFIRE Total Fuel Change Tool. NIFTT offers several online courses that facilitate the learning and implementation of these tools, in addition to courses focusing on fire behavior, fire effects, and fire regimes in forests and rangelands. Six courses are currently available, with several more in development. To assist independent student learning, NIFTT has developed "Learning Pathways" that provide easy-access to related learning materials in an order designed for optimal learning efficiency, currently featuring the concepts of fire behavior, fire effects, and fire regimes. Additional information and registration for these courses and detailed descriptions of the Learning Pathways are available at www.niftt.gov. This poster will provide information on the available NIFTT learning tools, courses, and learning pathways.

425 **Strand, Eva** (University of Idaho / NIFTT), evas@uidaho.edu

Colleen Ryan (National Interagency Fuels, Fire, and Vegetation Technology Transfer), Eva Strand (University of Idaho / NIFTT)

Learning to Predict Vegetation Change: a Step-wise Progression for Acquiring State and Transition Modeling Skills

Understanding the relationships between vegetation dynamics and disturbance processes can challenge today's land manager. State-and-transition modeling using the Vegetation Dynamics Development Tool (VDDT) and Path software has proven to be useful for natural resource professionals in addressing a wide range of questions related to forest and rangeland management, fuels planning, wildlife habitat management, and ecosystem carbon modeling. The LANDFIRE project has developed a set of vegetation dynamics models for U.S. ecosystems using the VDDT software. These models distill ecological knowledge provided by thousands of local experts, offering valuable information for resource managers, who can adapt these models to address a range of resource management questions, including restoration of ecosystem resilience. To facilitate this process, the National Interagency Fuels, Fire, and Vegetation Technology Transfer (NIFTT) is developing a set of online courses to assist users in learning to understand, create, modify, and use vegetation dynamics models with the new Path modeling software. These courses are organized into a "learning pathway" that will begin with basic modeling concepts for novice users and continue through the introduction of advanced applications. Students will be able to enter the pathway at any point, depending on their individual experience and needs. The learning pathway will include coursework describing the development of the LANDFIRE vegetation models, as well as techniques for adapting these models to address specific land management applications.

426 **Stropki, Cody** (SWCA Environmental Consultants), cstropki@swca.com

Cody Stropki (SWCA Environmental Consultants), Victoria Amato (SWCA Environmental Consultants), David Lightfoot (SWCA Environmental Consultants), Joseph Fluder (SWCA Environmental Consultants)

Impacts of the 2008 Trigo Wildfire on Ecosystems

In April 2008 the Trigo Wildfire burned 5,548 hectares (13,709 acres) of ponderosa pine (Pinus ponderosa) and mixed conifer stands in the Manzano Mountains of central New Mexico damaging, disrupting, and destroying ecosystem processes and resources. This fire burned with a mosaic of severities on the Cibola National Forest and adjacent private lands, providing researchers with an opportunity to evaluate the effects of fire severity on ecosystem resources and functioning. Twenty one monitoring plots were established 2 months after the fire in areas of different burn severities (low, moderate, and high severity) and unburned areas, and were replicated across the burn scar. Ecosystem resources addressed in this study include measurements of over and understory vegetation, timber resources, flammable fuels, hydrology, soils, and wildlife. The results of this 3-year study show the ecosystem response through time following the wildfire as well as the cumulative impacts that fire severity has on ecosystem resources. We found damages to ecosystem resources and functioning to be most pronounced in high severity burned areas when compared to low and moderate severities. We show how each resource category within each severity class changed over the 3-year period.

427 **Trader, Laura** (National Park Service), laura_trader@nps.gov

Laura Trader (National Park Service), Beth Gastineau (National Park Service)

Biotic and Abiotic Factors Contributing to New Mexico's Largest Wildfire: The Las Conchas Fire

Many of the biotic and abiotic factors that contribute to fire magnitude couldn't have been more aligned in the months and years preceding the Las Conchas Fire, New Mexico's largest wildfire. The Las Conchas Fire ignited in the Jemez Mountains in north-central New Mexico on June 26th, 2011, after an aspen tree fell on a power line. The fire ultimately burned 62,500 hectares (ha), with more than 17,000 ha burned in the first 14 hours, an unprecedented rate of fire spread and forest fuel consumption in this forest type and fire regime (predominantly frequent, low intensity, surface fires). To examine several of the abiotic factors contributing to the magnitude of the Las Conchas Fire, we combined approximately 10 years of meteorological data, including temperature, relative humidity, precipitation, wind speed, and wind direction, from a weather station located at a fire tower in the Jemez Mountains, with other information such as fuel moisture, slope, and aspect. The biotic factors that we investigated include surface fuel loading, fuel type, and tree densities. On a longer temporal scale, we also considered that climate change, resulting in higher temperatures, increased drought frequency, and more intense El Nino/La Nina Southern Oscillation events, as well as a land use history in the Jemez Mountains that includes extensive livestock grazing, logging, and

effective fire suppression, has resulted in increased sensitivity of this landscape to fires of this magnitude.

428 **Vaillant, Nicole** (US Forest Service - Pacific Northwest Research Station), nvaillant@fs.fed.us

Nicole Vaillant (Western Wildland Environmental Threat Assessment Center), Alan Ager (Western Wildland Environmental Threat Assessment Center), David Owens (Central Oregon Fuel Management Service), Stuart Brittain

Landscape Treatment Designer: A multicriteria optimization tool for fuel treatment planning

The Landscape Treatment Designer (LTD) program is a multicriteria optimization routine to help design fuel treatment scenarios according to spatial and non-spatial objectives. The input data represent polygons that are attributed with information about expected fire behavior and the polygons overall contribution to one or more landscape management objectives. These can include non-spatial attributes such as stand conditions, and/or spatial attributes like the distance to fire susceptible landscape features like critical habitat or residential structures. The user supplies a treatment constraint that represents the maximum area that can be treated based on budgets or other constraints. In a simple application, the program operates the same as sorting a shapefile attribute table based on fields of interest and then selecting polygons from the sorted list until some total area limit is met. However, LTD automates the process and allows for combining several attributes in weighted combinations so that treatment alternatives can be quickly generated and mapped. A non-adjacency problem would allocate treatments based on objective values regardless of their location relative to each other. LTD also has adjacency constraints that allow it to coordinate treatments and build patches that can serve as wildland fire use areas or large scale prescribed fire treatment areas.

429 **Vaillant, Nicole** (US Forest Service - Pacific Northwest Research Station), nvaillant@fs.fed.us

Nicole Vaillant (Western Wildland Environmental Threat Assessment Center), Alan Ager (Western Wildland Environmental Threat Assessment Center), John Anderson (BalanceTech, LLC), Lauren Miller (Deschutes National Forest)

ArcFuels: An ArcGIS Interface for Fuel Treatment Planning and Wildfire Risk Assessment

Wildland fire risk assessment and fuel management planning on federal lands in the U.S. is a complex problem that often requires advanced fire behavior modeling and intensive spatial data analyses. Both the benefits and potential impacts of proposed fuel treatments must be clearly demonstrated in the context of land management goals and public expectations. Potential fire behavior metrics, including fire spread, intensity, likelihood, and ecological risk need to be analyzed for proposed fuel treatment alternatives. We built ArcFuels to streamline the fuel management planning process, and provide tools for quantitative wildfire risk assessment. ArcFuels integrated a number of fire behavior models and corporate spatial data

within a GIS framework. The system vastly simplifies spatial data manipulations and wildfire behavior analyses for designing and testing fuel treatment alternatives.

430 **Villalobos, Carlos** (Texas Tech University), C.Villalobos@ttu.edu

Leobardo Richarte (Texas Tech University), Carlos Villalobos (Texas Tech University)

EFFECT OF FIRE AND CLIPPING ON PURPLE THREEEAWN (Aristida purpurea) MORTALITY AND BASAL AREA CHANGE DURING THREE PHENOLOGICAL STAGES

The objective of this study was to evaluate the effect of fire and clipping on purple threeawn (Aristida purpurea) on 1) plant survival and 2) change in basal area, during vegetative, reproductive and post-reproductive phenological stages in the Southern Great Plains. One hundred and twenty plants were randomly at each phenological stage. Forty plants were clipped simulating 90% grazing utilization, forty more were burned individually using a combination of pressure (PSI) and time (sec) to simulate present temperatures during a wildfire in a shortgrass prairie and forty were used as control. During each phenological stage right after applied burning/defoliations treatments we measured basal width and basal length variables and calculated basal area (initial area), at the end of the growing season we took the same measurements on each treated plant (final area). Plant survival and change in basal area were significantly ($P<0.05$) affected by an interaction between phenological stage and defoliation type. During vegetative stage clipping was the only defoliation type that reduced basal area and promoted plant mortality at considerably higher ($P<0.05$) levels than of control pants. On the other hand, during reproductive and post-reproductive growth stages, burned plants averaged higher ($P<0.05$) reductions in basal area and higher mortalities than control plants. During reproductive stage threeawn plants are more sensible to damage by defoliation events. In conclusion, fire proved to be the best strategy in reducing purple threeawn during vegetative stage on infested grassland in the Southern Great Plains.

431 **Villalobos, Carlos** (Texas Tech University), C.Villalobos@ttu.edu

Leobardo Richarte (Texas Tech University), Carlos Villalobos (Texas Tech University)

FIRE AND CLIPPING EFFECT ON PURPLE THREEEAWN (Aristida purpurea) FORAGE QUALITY DURING THREE PHENOLOGICAL STAGES

We evaluate the effect of fire and clipping on purple threeawn (Aristida prupeurea) on 1) forage quality (crude protein (CP), and in vitro dry matter digestibility (IVDMD), during vegetative, reproductive, and post-reproductive growth stages in the Southern Great Plains, and 2) to develop a regression equation to predict purple threeawn biomass production during the three growing stages in the Southern Great Plains. Fifteen plants were clipped simulating 90% grazing utilization; fifteen were burned individually using portable propane burner by calibrating a combination of pressure (PSI) and time (sec) to simulate present temperatures

during a wildfire in a short grass prairie. In addition, fifteen more plants were used as a control plants. To determine forage quality two, four and six months after defoliations/burning, forage was collected from defoliated plants. CP content and IVDMD on defoliated plants were significantly affected (P<0.05) by and interaction between defoliation type and sampling time, at each phenological stage. Burned and clipped plants averaged higher (P<0.05) CP and IVDMD values than control plants during vegetative and reproductive stages and lower during the first two sampling collections. Our data proved that purple threeawn has a poor forage quality during most of the growing season, but through management tools such as prescribed burning it is possible extend and sometimes increase its forage value. In addition, our regression models were efficient to predict biomass of threeawn plants at each phenological stage. These models can be used to estimate fuel mass before applied prescribed burning.

432 **Villalobos, Carlos** (Texas Tech University), C.Villalobos@ttu.edu

José Francisco Villanueva (INIFAP-Mexico), Carlos Villalobos (Texas Tech University), Miguel Luna (INIFAP-Mexico), Rodolfo Barretero (INIFAP-Mexico), Luis Fernando Negrete (INIFAP-Mexico), Carlton M. Britton (Texas Tech University)

Effect of Prescribed Burning in Six Tropical Grasses in the West Coast of Mexico

A three year study was conducted in Nayarit, Mexico with the objective of evaluating the effect of fire on yield, forage quality, and height of six tropical grasses. Panicum maximum and Hyparrhenia rufa were studied at El Verdineño Experimental Station. Cenchrus ciliaris, P. maximum var. Trichoglume, Cynodon plectostachyus, and C. dactylon were studied at El Macho Experimental Station. Treatments applied were prescribed burn and an unburned control. Two, 150-m2 field plots were used per treatment during three consecutive years. Each year in late May and early June, experimental areas were burned and environmental conditions recorded including temperature, relative humidity, wind speed, and soil moisture. When regrowth initiated, grasses were sampled at 15-day intervals until maturation. Analysis of variance and mean separation (LSD) tests were conducted. The response of grasses to fire varied with species. Yield of P. maximum, H. rufa, C. plectostachyus, and C. dactylon were not improved (P<0.05) by fire. In contrast, C. ciliaris and P. maximum var. Trichoglume showed a positive response (P<0.05) to prescribed burning. Forage quality was improved by fire in all forage species. Height of C. ciliaris was positively (P<0.05) influenced by fire. Prescribed burning only increased yield in two grasses, but forage quality was improved for all species. Fire is ordinarily used in tropical areas to eliminate old growth, to maintain pastures free of weeds, and to reduce certain insect pests. In this case results obtained are of great value for pasture management and animal production implications.

433 **Villalobos, Carlos** (Texas Tech University), C.Villalobos

Miguel Luna (INIFAP-Mexico), Carlos Villalobos (Texas Tech University), Carlton M. Britton (Texas Tech University), José Francisco Villanueva (INIFAP-Mexico), Rodolfo Barretero (INIFAP-Mexico)

Effect of Intensity and Burning Season on Two Grass Species of the Chihuahuan Desert

We investigated effects of three burning seasons under two simulated fuel loads and two plants sizes on plant mortality and basal area of blue grama (Bouteloua gracilis (H.B.K) Lag) and broomgrass muhly (Muhlenbergia rigida) in the southern Chihuahuan Desert of Mexico. Prescribed fire was simulated using a portable propane burner calibrated to simulate time and temperature curves reached at 1,700 and 2,800 kg/ha fine fuel load. Plant Size classification was determined by initial basal area diameter. Plants with a basal area > 10 cm were classified as large. Plants with a basal diameter ≤ 10 cm were considered small plants. For each species, 50 plants in each size class were randomly treated each season at each fuel load. As control, 50 plant of each species and size received no fire treatment. Basal area change was estimated based on pixels/cm2, using vertical photos and the Adobe Photoshop Software. Blue grama was affected by season of burning, fuel load simulation, and plant size ($P < 0.05$). Small blue grama plants had higher mortality than large plants ($P < 0.05$). Burning at the high fuel load simulation in spring and summer reduced basal area of large blue grama plants, whereas winter burning increased it ($P < 0.05$). Basal area of muhly plants was generally reduced by all burn treatments ($P < 0.05$). Large muhly plants had average reductions of 24% and 48% with summer and winter burns respectively, while all burning seasons reduced basal area of small muhly plants.

434 **Villalobos, Carlos** (Texas Tech University), C.Villalobos@ttu.edu

Carlos Villalobos (Texas Tech University), Ricardo Soto (Universidad Autónoma de Chihuahua)

Effects of Prescribed Burning on Vegetation and Small Mammals on the Chihuahuan Desert

The objectives were to determine the effects of prescribed burning on; (1) vegetative species composition, (2) small mammal population composition, (3) vegetative productivity, and (4) forage quality (Crude protein (CP) and In vitro Organic Matter Digestibility (IVOMD). Treatments were control (C); winter burn (WB), and summer burn (SB), five experimental units per treatment were used. WB was conducted in March and SB was conducted in July. Initial biomass averaged 3160 kg/ha. Biomass in WB was reduced to 192 kg/ha, and in SB to 336 kg/ha respectively. Forage initial protein content averaged 3.7%. Both burning season increased crude protein content to 10.2% during the WB and 8.6% in the SB. In addition prescribed burning had a positive effect on digestibility values. Control experimental units showed an IVOMD average of 51.4% in contrast WB IVOMD values were increase to 64.0%, and for SB 61.0%. However, burning effects on tobosagrass cover was reduced 70.25% in WB and 75.0% during the SB respectively. Seven genus and ten species were recorded among a total of 125 individuals during the entire trapping period, winter burned plots had the most individuals captured with

46.4%, followed by the control plots with 37.6%, and summer plots with 16%. No change in species composition was noted. Tobosagrass was the dominant specie before and after burn

435 **Waring, Kristen** (Northern Arizona University), kristen.waring@nau.edu

Anna Higgins (Northern Arizona University), Kristen Waring (Northern Arizona University), Andrea Thode (Northern Arizona University)

The effects of burn entry and burn severity on stand structure and composition in Grand Canyon National Park

Like many fire adapted forests, the forests on Grand Canyon's North Rim, AZ have undergone considerable change since fire exclusion began in the late 1800's. Increased tree densities, heavy fuel accumulations and an increase in late successional, fire-intolerant trees have resulted in more moderate- to high-severity fire occurring where fire is reintroduced. Grand Canyon National Park's fire program began over 30 years ago and uses both prescribed and wildland fire to reduce fuel loading and restore functioning ecological processes. We compared tree regeneration patterns following several mixed severity fires that have burned in the two forest types since 1999: ponderosa pine with white fir encroachment and dry mixed conifer. We found first-entry, low-severity fire was not effective at reducing white fir densities in either forest type. Repeated entries are likely needed to reduce white fir densities in both forest types and ponderosa pine regeneration in the ponderosa pine with white fir encroachment. Additionally, we found evidence for a shift in forest type in the dry mixed conifer forest to aspen following high-severity fire. Implications for fire management in Grand Canyon National Park include number of burn entries and severity levels required to meet the desired forest conditions. Managers may need to utilize mechanical treatments in addition to prescribed burning treatments to better meet target forest conditions.

436 **Weisenberger, Mara** (U.S. Fish and Wildlife Service), mara_weisenberger@fws.gov

Louis Bender (New Mexico State University), Mara Weisenberger (San Andres NWR)

Restoring Big Game Habitat with Landscape-scale Prescribed Fire

The San Andres National Wildlife Refuge (Refuge) encompasses the southern third of the San Andres Mountains in south central New Mexico, and lies within the northern most extension of the Chihuahuan Desert. A vegetation gradient exists with Chihuahuan Desert in the lower elevations, desert grasslands above and in some higher elevations and northern facing slopes piñon-juniper and oak woodlands. These woodland species have increased in the desert grasslands over the last 100 years due to overgrazing, fire suppression, and climate change. Prescribed burns have been designed to reduce fuels and fire threats over the broader landscape to create habitat diversity to enhance watershed function, and to maintain open native grassland and savanna ecosystem structure. Burning is frequently prescribed to

increase habitat quality for big game species, such as mule deer (Odocoileus hemionus), elk (Cervus elaphus), and pronghorn (Antilocapra americana), and can be an economically viable alternative to more costly management practices, such as forage plots or feeding, for increasing the quality of wildlife habitat and economics of wildlife enterprises. However, there are significant differences between burning to benefit big game and their habitat and burning for other ecological factors, such as brush control, mimicking "natural" fire regimes, or urban-interface clearing. Optimal burning prescriptions for big game habitat differ from other burning prescriptions in terms of season of burn, intensity of burn, and other factors. This results in many burns, even if conducted to benefit big game, actually having fewer positive benefits than they could have.

437 **Wells, Lynn** (FRAMES - University of Idaho), lynnwt@uidaho.edu

Lynn Wells (FRAMES - University of Idaho), Diana Olson (FRAMES - University of Idaho), Gregory Gollberg (FRAMES - University of Idaho), Kelly Lotts (Montana State University)

FRAMES – a resource for fire science delivery and technology transfer

The Fire Research And Management Exchange System (FRAMES) facilitates online information exchange and technology transfer among wildland fire researchers, managers, and other stakeholders. With USGS support, the FRAMES portal provides searchable information, a platform for data sharing and storage, development of new tools, and support to U.S. federal wildland fire management agencies throughout the various stages of wildland fire, including planning, operation, and post-fire monitoring. FRAMES provides an array of services for practitioners, including the Resource Cataloging System (RCS), a searchable online database of data, documents, web pages, tools, projects, and programs; a web-enabled version of the First Order Fire Effects Model (FOFEM); and online training for wildland fire managers developed by the National Interagency Fuels, Fire, and Vegetation Management Technology Transfer Team (NIFTT) and the National Wildland Fire Coordination Group (NWCG). FRAMES hosts educational materials on air quality and smoke management developed by the NWCG Smoke Committee (SmoC) and the University of Idaho, the Joint Fire Science Program's Interagency Fuels Treatment Decision Support System (IFT-DSS) background information site, and archived webinars for the Lessons Learned Center. FRAMES also includes the Fire Effects Monitoring & Inventory Protocol (FIREMON) and FFI Ecological Monitoring Utilities, and the Strategic Environmental Research Development Program (SERDP) emissions database. Since 2010, FRAMES has supported several JFSP-funded Knowledge Exchange Consortia, and FRAMES partnered with the Southwest Fire Science Consortium to help fire managers access fire science information in the RCS related to the Southwest's top ten fire management science issues.

438 **Wolfson, Barbara Satink** (Northern Arizona University), barbara.wolfson@nau.edu

Joint Fire Science Program

The Joint Fire Science Program's Knowledge Exchange Consortia

Funded by the Join Fire Science Program, a nationwide fire science delivery network of eight Consortia are currently facilitating information transfer. These Consortia are designed to accelerate the awareness, understanding, and adoption of wildland fire science information by federal, tribal, state, local and private stakeholders within ecologically similar regions. For more information visit www.firescience.gov/JFSP_Consortia.cfm New Consortia: Six new consortia are in the planning phase. Needs assessments are currently being conducted in the following regions: Hawaii (cgiardina@fs.fed.us), Northern Rockies (vwright@fs.fed.us), Oak Woodlands (kgrabner@usgs.gov), Pacific Northwest (janean.creighton@oregonstate.edu), Short Grass Prairie (david.engle@okstate.edu), and Tall Grass Prairie (phzedler@wisc.edu).

439 **Wolfson, Barbara Satink** (Northern Arizona University), barbara.wolfson@nau.edu

Southwest Fire Science Consortium

The Southwest Fire Science Consortium: A New Opportunity in Fire Science and Management

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.