Rx Effects

National Park Service
U.S. Department of the Interior

Fire Ecology Program

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Beetle killed trees

Impacts of mountain pine beetle on lodgepole pine fire behavior

Nate Williamson, Mike Lewelling – Rocky Mountain National Park
Monique Rocca, Bill Romme – Colorado State University

Mountain pine beetle (*Dendroctonus ponderosae*) populations have reached epidemic levels throughout the western U.S. and Canada. Although the pine beetle is a native insect, population levels currently being observed within Rocky Mountain National Park and elsewhere are without precedent in recorded history (see Figure 1). The resultant tree mortality will affect future stand structure and composition and fuel dynamics in our forests for decades to come. There is considerable uncertainty as to how the current epidemic will affect future fire behavior in beetle-killed stands. Following attack by the beetle, the impacted trees are killed and the needles subsequently die and dry out. These red needles will remain on the tree for 2-3 years before falling to the forest floor. It is thought that the risk of a crown fire may be greater in stands composed primarily of standing dead trees with red needles than in stands of green trees. A prescribed burn project was conducted at Rocky Mountain National Park to investigate the flammability of lodgepole pine (*Pinus contorta*).

Lodgepole pines in the following stages of time since beetle attack were selected and identified prior to treatment: unattacked (full crown of green needles), attacked previous growing season (crown still green), attacked 1 year ago (crown of mixed red and green needles), attacked 2 years ago (crown completely red, 80-100% needles remaining), attacked 3 years ago (red crown, 60-79% needles remaining), attacked 3+ years ago (red crown, less than 60% needles remaining). Crowns were ignited individually or in small groups from the ground utilizing a propane wand. Treatment occurred in late spring with snow on the ground to minimize the risk of an escaped fire.

Preliminary results indicate that under typical late winter/early spring conditions, the crowns of green trees (whether attacked or unattacked) are not receptive to fire (see Table 1).

Table 1.

Lodgepole Crown Status	Number of Trees	% of Crown that Carried Fire
alive, not attacked	5	0%
attacked, still green	3	0%
mixed red and green needles	1	100%
red needles, 80-100% remaining	3	100%
red needles, 60-79% remaining	2	50%
red needles, 40-59% remaining	3	0%

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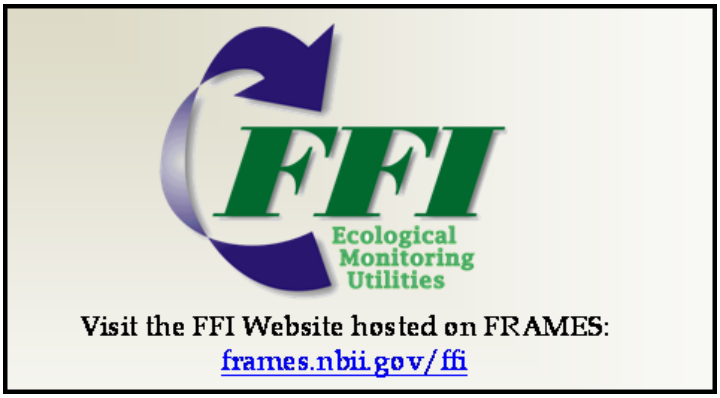
FFI – Less is More

MaryBeth Keifer-Fire Management Program Center



FFI version 1.04.01 was released in the fall of 2010. Behind the scenes improvements included changes to the database key to speed performance and compatibility with Windows 7 and SQL Express 2008. Also, Query Tool users cheered when the new "Apply Selections" button appeared on the Query menu, saving time by only refreshing the data grid upon request.

Coming soon to the next version of FFI (late winter 2012) are two user-requested updates designed to improve the FFI experience:

- Add the ability to save queries to improve the efficiency of the Query Tool.
- Create "FFI-Lite", a simpler version of FFI designed to run on tablets and laptops.

Saved queries are created at the Administrative Unit level, saved on the local machine and accessible by any user who can log on to the local machine. To increase the efficiency of electronic field data collection, FFI-Lite can be used instead of the current PDAs. FFI-Lite uses SQL-CE, which is easier to install and use than SQL Express. Users may either use FFI-Lite in conjunction with the full FFI application or choose to use it as a stand-alone application for areas with less complex monitoring programs, limited IT support and/or limited computer equipment. The specific functionality of FFI-Lite is still under development but will emphasize supporting electronic field data collection and ease of installation.

As time and funding allow, we also hope to include some other updates that users have requested, such as adding global species replacement functionality in Species Management, allowing the option to keep Monitoring Status assignments for existing Macroplots/Sample Events when creating new Project Units, and associating the Disturbance History protocol with the Macroplot rather than the Sample Event.

What Does the Future Hold?

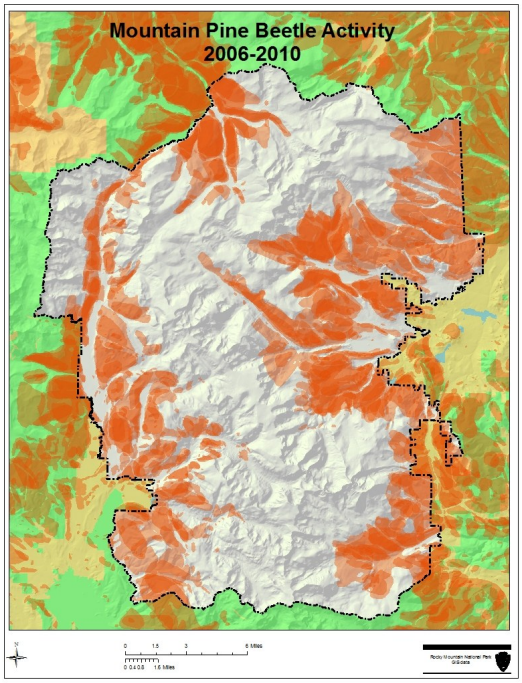
We will continue exploring a robust server- or Web-based FFI application to address several key issues including installation problems, agency IT compatibility, application speed, and FFI "help desk" workload. A number of questions remain to be answered before moving forward, especially in regard to IT security in the different agencies. FFI development has had solid funding over the past few years but future budgets will likely be less consistent. Funding for FY 12 may be less than FY11 but certainly adequate, so barring unforeseen circumstances, we anticipate FFI development will proceed on track through FY12. Like everyone else, we suspect funding amounts will decrease after FY12, so we are working to ensure the longevity of FFI even with reduced funding. This strategy means that, for the time being, we may need to concentrate on installation, configuration, and database improvements rather than proceed with suggestions for changes from the field.
Training announcements, software, user guides, training materials and more are available on the FFI FRAMES Web site (http://frames.nbii.gov/ffi). As always, the FFI development team is interested in hearing your comments about our development plans and your suggestions for system improvements. You can post suggestions on the FFI discussion group at http://groups.google.com/group/ffiemu or contact Duncan Lutes (dlutes@fs.fed.us) or MaryBeth Keifer (marybeth_keifer@nps.gov).

Impacts of mountain pine beetle on lodgepole pine fire behavior, continued from page 1.

Red needled crowns are more receptive to fire, however period of increased risk is only about 2 years. Following the loss of 20% or more of the needles, the resulting lower crown bulk density limits fire spread in beetle-killed trees. Hence, the perception of increased fire risk due to mountain pine beetle activity may be exaggerated: red-needled trees may be more receptive to fire, however the period of increased risk is short-lived. Managers of landscapes that include lodgepole pine should keep in mind that it is a fire-adapted species and there will always be a risk of high intensity fire with or without the mountain pine beetle.

Lodgepole pine beetle killed stand.

Figure 1.



Mountain pine beetle activity map.

1st Annual NER/SER Fire Ecology Summit

Caroline Noble-SE Regional Fire Ecologist

In September 2011, Shenandoah National Park hosted the first annual gathering of fire ecology staff from the two adjacent regions. The purpose of the gathering was primarily to assist the SHEN fire effects team (Mountains to the Sea Group) with pre-burn plot installation. Additionally, the crews were able to share field tips and techniques and to briefly meet with Regional Office staff to discuss strategies for sharing resources across regional boundaries.

Discussing ecological effects from a 2008 Rx fire at Shenandoah National Park.

A total of 12 individuals participated including staff from GRSM, NATR, SHEN, SERO, and NERO. Despite foggy and rainy conditions, the crews enjoyed camping together at the NPS Loft Mountain Campground.

Participants decided that this was a highly productive way to both conduct field work and collaborate on common issues. SER intends to host a similar gathering in September of 2012.

Monitoring the Effects of Fire on the Exotic Fern, *Lygodium microphyllum,* in the Coastal Prairies of Everglades National Park

Colleen Holland and Mayavati Tupaj

Lygodium microphyllum is an exotic, invasive climbing fern that uses the support of shrubs and trees to grow in dense mats, shading out the native vegetation underneath. Lygodium was first discovered in the Coastal Prairies of Everglades National Park in 1999. The Coastal Prairies are a fire adapted ecosystem comprised of seasonally flooded prairies, with interspersed tree islands, surrounded by mangroves. Originally Lygodium was found in and around the tree islands; recently though, Lygodium has been found in the open prairie areas. Because of the seasonal flooding of the prairies its growth seems to be restrained to the higher elevated grass tussocks.

Lygodium, the bright green vegetation, is climbing a dead shrub in one of the plots. While Lygodium is present in the grass below, it requires the support of woody vegetation to grow vertically.

The current treatment regime for Lygodium combines herbicide treatment and prescribed fire in an attempt to reduce above ground biomass. After a unit is treated with herbicide it is burned, and then maintained at a two year fire rotation. If herbicide treatment is not possible, burning alone on a two year fire rotation is implemented. While the Everglades Fire Effects program has FMH plots scattered over the prairies, the plots were not providing a direct comparison of the burned versus un-burned fire effects on Lygodium. After coordinating with the Everglades Exotics program, six additional paired plots were installed in burned and unburned areas following a prescribed burn in April 2011. These new plots are located in similar burned and unburned areas, and will provide a closer look at the effects of fire on the growth and reproduction of Lygodium.

To examine the effect of fire on Lygodium cover and abundance in the Coastal Prairies, several protocols are used to monitor Lygodium in the six paired plots. The plot is a 30m diameter circular area around a 30m long transect. Protocols along the transect include point intercept, line intercept and tussock occupation; and an ocular overall percent cover estimate is conducted in the 30m circular plot. Along with monitoring changes in percent cover, the amount of fertile leaves is estimated in three 20 cm sub-plots. This will help determine the effects of fire on fecundity. The plots were installed one month post burn and will be monitored at 6 months, 1 year and 2 years post burn. After two years the data will be analyzed and the objectives will be evaluated.

The point intercept protocol is based off the FMH design; however, the native species are recorded to lifeform while the exotics are identified to species. The line intercept protocol measures where Lygodium starts and stops along the transect. The point intercept captures more details on the structure of the plot than the line intercept; however, the sensitivity of the line intercept is valuable to detecting small changes in cover. Lygodium requires the higher elevation of grass tussocks for suitable habitat in the wet prairies. All tussocks that intersect the transect are recorded and noted for the presence or absence of live Lygodium. This will monitor the effect of fire on the spread of Lygodium into unoccupied habitat.

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Fire Effects Crews as Firefighters: Improving the Value and Validity of our Programs

Jon Freeman – Teton Interagency Fire, Grand Teton NP & Bridger-Teton NF

Now more than ever, fire effects crews need to prove to their park and regional offices that they are a critical and necessary piece of the fire management puzzle, both now and in the future. We need to take a good look at the big picture of fire effects monitoring, and ask ourselves if we are meeting the needs of fire management. To what extent are we collecting "nice to have" data versus relevant information to help in decision making? Are we serving the master of documentation and file maintenance, rather than participating in adaptive management?

Here at Teton Interagency Fire, when we interview prospective fire effects employees, we like to ask them, "Do you consider yourself more a biologist, or a firefighter?" This is a trick question, because we are looking for the people who have trouble answering. That's because we are looking for those unique individuals who want to be both.

We have been told that the plots we read and the data and analyses we produce are extremely valuable, but we feel like fire effects should go beyond that, and be indispensable. That's why we have chosen to promote our employees not only as fire effects monitors, but as fully prepared and well-qualified firefighters. So far this has met with resounding success. Both Grand Teton National Park and the Bridger–Teton National Forest employ the fire effects crew in all aspects of fire management and all-risk response. This in turn provides a more diverse and varied experience for our crewmembers, improving applicant pool quality as well as crew morale. This leads to increased overall productivity and efficiency, all while providing our supporters and partners with a higher quality product. This paper seeks to outline how the Teton Interagency Fire Effects Program got to this point and how other fire effects programs might employ a similar approach.

After working for or with a half dozen NPS fire effects programs, I've come to realize that the NPS's fire effects crews might be the most diverse and varied of any fire crew in the country. This is in part due to the diverse work we perform, but it's also partially due to the fact that fire ecologists and crew leads rank applicants and hire employees based on a wide range of skills and experience. While the work that our programs perform is highly variable, there are a few core components that most, if not all, of our programs employ. First and foremost is plot work. This itself is highly variable, encompassing vegetation ID, fuels monitoring, photo points, post-burn severity, and dozens of other components. Of course there's data entry and hopefully a little fire. But outside of those responsibilities, the fire effects/ecology track allows for significant flexibility. This is where the ecologists and lead monitors can use a little creativity to develop and diversify their programs.

After being involved in the hiring of four season's worth of crews with two different fire effects programs, I've come up with a formula that I believe works. We hire crewmembers with both "crew" and fire experience. It's the immeasurable qualities that we look for in a future employee. Someone who's spent time on fire crews specifically, but also outdoor crews of any kind. This type of individual has without fail worked out wonderfully on our crews. These employees come to you with an attitude that instantly builds a cohesive crew environment. They also know how to work well in small groups in the woods, which we've found to be much more valuable than a person who can differentiate ten different species of wheatgrass. If these crewmembers come with fire operational experience and qualifications they become even more valuable to the crew and the fire program as a whole. We place some emphasis on the fire effects experience of the applicants, and even less on their botanical experience. With quality crew supervision, the details of fire effects plot work, including general, localized plant ID, can be taught in as little as a week. To us, it makes the most sense to hire quality people

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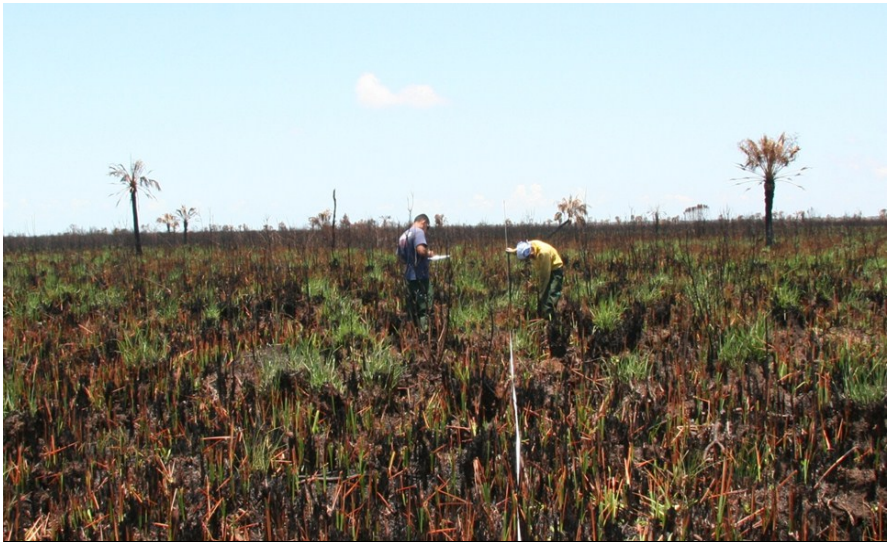
Monitoring the Effects of Fire on the Exotic Fern…..continued from page 4.

An ocular estimate of Lygodium cover is conducted in the 30m diameter plot around the transect. This protocol was added to cover a larger sampling area, for it was noticed in previous FMH monitoring visits that Lygodium may not fall directly on the transect, but is often in at least small quantities nearby. The circular plot is divided into four quarters and Lygodium, native and other exotic percent cover is estimated for each quarter. The percent cover categories are .1-5%, 6-25%, 26-50%, 51-75%, 76-95%, or 96-100%. While the ocular estimates are useful in plots with low cover, the large cover categories will limit the sensitivity of this protocol in detecting changes in cover. The more sensitive data collected from the transect will detect smaller changes in Lygodium cover.

Along with the new plots installed this year, there are 17 other permanent FMH plots located across the Coastal Prairies. These are the standard 30m brush plots; however, the monitoring methods have been revised to address new objectives in the burn units. The three transect protocols and the ocular estimate protocols are conducted at each FMH plot with the objective of capturing landscape level changes in Lygodium. Many of these plots are currently free from Lygodium and will play an important role in monitoring the spread into unoccupied areas.

The effect of fire on relationship between Lygodium biomass and amount of spore producing plant parts is another question being evaluated with the new monitoring protocols. Lygodium reproduces on new growth pinnae, causing the pinnae to lobe deeply with the sori appearing on the underside. The deeply lobed pinnae are easy to spot, but hard to quantify across the entire plot. To gain more repeatable results, three 20cm sub-plots are used to estimate percent native cover, percent Lygodium cover, and of the Lygodium, percent fertile leaves. These will be used to monitor whether or not fire plays a significant role in changing fecundity.

As of August 2011, the initial plot reads have been completed and early examination of the data show site specific results. Two of the sites, as expected, have lower Lygodium coverage in the burned plots. However, one site has higher Lygodium coverage in the burned area. For all cover monitoring methods, estimates are similar for the plots with higher Lygodium coverage. Plots with low cover measured along the transect (point intercept cover of 2% or less) do have higher ocular estimates, supporting the need for the 30m circular plot.



A member of the fire crew assisting Fire Effects with a post burn read in an FMH Coastal Prairie plot.

Fire Effects Crews as Firefighters: Improving the Value…continued from page 5.

and give them the tools and teach them the skills necessary to collect quality fire effects data. If they have on the ground fire experience, they have insight into the big picture of fire management that purely academically-trained people do not.

With both the Northern Great Plains and the Teton Interagency fire effects crews, we focused on hiring crewmembers with these values. Outside of our day to day plot work, all of our crewmembers were most interested in gaining fire experience. While conducting our plot work, we were statused daily as an initial attack squad, carrying full personal fire gear, handtools and chainsaws, and overnight gear. On several occasions our crew was utilized for initial attack on small fires, with crewmembers serving as fallers, squad bosses, and incident commanders. We also promote the fire effects crewmembers to other modules, which has netted the fire effects crew several details and to engine crews, helitack crews, T2IA handcrews, wildland fire modules, and fuels crews. This season alone the fire effects crew has spent over 100 days on fire assignments all while completing several hundred plots and entering almost all of our data, and it's only the beginning of September. The crew is also taking a lead role in monitoring managed fires on the park and forest, putting in plots and photo points ahead of actively burning wildfires.

The fire effects crew also actively participates in prescribed fire prep and fuels reduction projects. When the crewmembers view these experiences as a reward, they are that much more motivated to work hard to complete our plot work in an efficient manner. Their hard work is rewarded with the experiences they seek, not with more plot work, and this creates an even more positive work environment for everyone. This also creates a huge added value to the fire effects program, and our co-workers and partners perceive us as a legitimate fire resource.

As fuels funded employees, these fire assignments also save our programs and our regions significant amount of money. They also provided a big "bonus" paycheck to our employees. Assuming the crew lead can balance the crew's work load with this "collateral" fire operations work, there really is no downside to this strategy. When conducting end of season evaluations, we've been overwhelmed with positive reactions to this side of the job, with several employees citing this as the reason they plan to return for another season. We are also constantly thanked for our contributions by FMOs, module supervisors, and other fire managers. It is imperative for ecologists and crew leads to glean the greatest value from their fire effects crews, especially when funding becomes an issue, and we feel that this is an excellent way to do so.

We hope that with this varied experience our employees will be the fire managers of the future because they are multi-faceted and in tune with the ecological side of fire. They will make excellent FMOs, superintendents, district rangers, and forest supervisors, and if they follow the fire effects/ecology track, they will be well informed about how fire management plays out on the ground at the local level.

For more information about the Teton Interagency Fire Effects Crew, visit our website at: http://gacc.nifc.gov/egbc/dispatch/wy-tdc/fire-effects-crew.html.

Upcoming Conferences

- **Interior West Fire Ecology Conference**—Snowbird UT—Nov. 14-17, 2011.
- **Southwest Fire Ecology Conference**— Santa Fe, NM— Feb. 27-Mar. 1, 2012.
- **5th International Fire Ecology and Management Congress**— Portland, OR—Dec. 3-7, 2012.

Monitoring Trends in Burn Severity

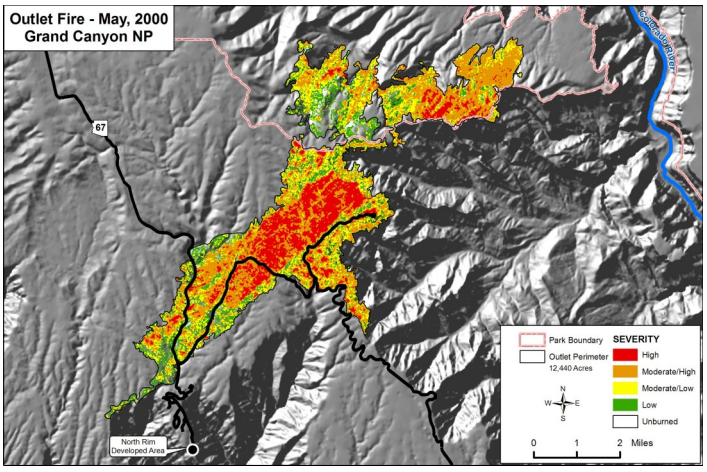
Nate Benson, Eric Gdula, and Josh Picotte

Six years after beginning the project, with over 14,000 fires mapped and only 500 more fires to go, Monitoring Trends in Burn Severity (MTBS) is close to completing its project goal of mapping all large fires from 1984 to 2010. So what exactly is MTBS? It is a multi-year project that started in 2004 to consistently map the burn severity and perimeters of large fires, greater than 1000 acres in the West and more than 500 acres in the East, across all lands of the United States for the period spanning 1984 through 2010 using Landsat satellite imagery. The project is conducted through a partnership between the U.S. Geological Survey National Center for Earth Resources Observation and Science (USGS EROS) and the USDA Forest Service Remote Sensing Applications Center (RSAC) with the National Park Service (NPS) also playing a critical role. In 2001, the NPS initiated a service-wide burn severity mapping effort with USGS EROS, called the National Burn Severity Mapping Project. The success of this project highlighted both the feasibility and need for a broader interagency effort to map the burn severity on all large fires. Other than the 2010 fire season, which will be completed by 2011, MTBS has now completed the mapping of all large fires for the conterminous United States and Alaska and Hawaii back to 1984.

The NPS has made important contributions to MTBS by using and validating their products. The investments NPS has made in fire GIS specialists, fire ecologists, and fire effects monitors has enabled the park service to make use of this rich data set. Fire ecologists and fire effects monitors have worked with fire GIS specialists to establish field plots to validate and refine the MTBS severity estimates, which has enabled many parks to assess the maps' strengths and weakness and to effectively integrate MTBS data into their monitoring and planning efforts. Two examples of how many parks and regions are making innovative use of these data are Grand Canyon National Park (GRCA) and the Southeast Region (SER).

The GRCA Fire and Aviation program recently completed an Environmental Impact Statement (EIS), with the incorporation of MTBS data, to assess alternative activities for a new Fire Management Plan (FMP) and potential effects of these alternatives to park resources. The EIS included four fire management alternatives: non-fire treatments, prescribed fire, fires managed for multiple benefits, and a mix of these activities. MTBS data from prescribed fires and wildfires for each vegetation type in the park were used to project the percentage of the landscape that might burn in each burn severity class for each alternative. This analysis allowed GRCA staff to predict the potential effects of each alternative to biological, cultural, physical, and social resources.

Map 1 Grand Canyon National Park, Outlet Wildfire



Burn severity map of the Outlet wildfire GRCA.

MTBS data have also been a critical component in a Biological Assessment for the GRCA FMP. Using a combination of permanent monitoring plots and MTBS data, park staff quantified the relationship between burn severity mapping classes and effects to Mexican Spotted Owl critical habitat components. By determining the relationship between MTBS data and specific monitoring variables, such as change in tree basal area, park staff have been able to better assess large-scale change in habitat components with fewer resources and gain a greater understanding of how fire management activities are affecting habitat components across time and space.

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Fire Management Prioritization Modeling Methodology

John Young, Biogeographer, USGS, Leetown Science Center
Carolyn Mahan, Associate Professor, Penn State University
Missy Forder, Fire Ecologist, Shenandoah National Park

We constructed a simple spatial model to assist in fire management prioritization in Shenandoah National Park. Inputs to the model included a map of vegetation associations, maps of fire history boundaries and locations, and a map of search and rescue compartments for the park defined along ridgetops, streams, and trails. Additional data layers included maps of the park boundary, a map of fire suppression areas, maps of cultural and historic districts and maps of rare species locations. Vegetation associations were recoded into five classes of fire tolerance based on consultations with botanists and fire ecologists such that the most fire tolerant community was assigned a value of 1 and the least fire tolerant communities were assigned a value of 5. Vegetation association maps are represented as a raster GIS layer with a resolution (cell size) of 17 by 17 meters (0.029 ha, 0.07 acres). This raster representation formed the framework for the rest of the analysis (Figure 1).

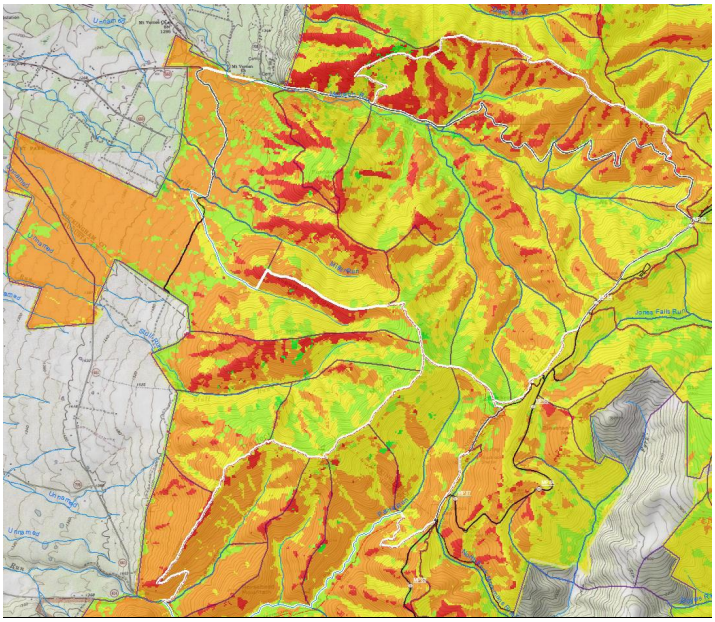

Figure 1. Vegetation community (raster) map recoded to fire tolerance. Red and orange are most fire tolerant.

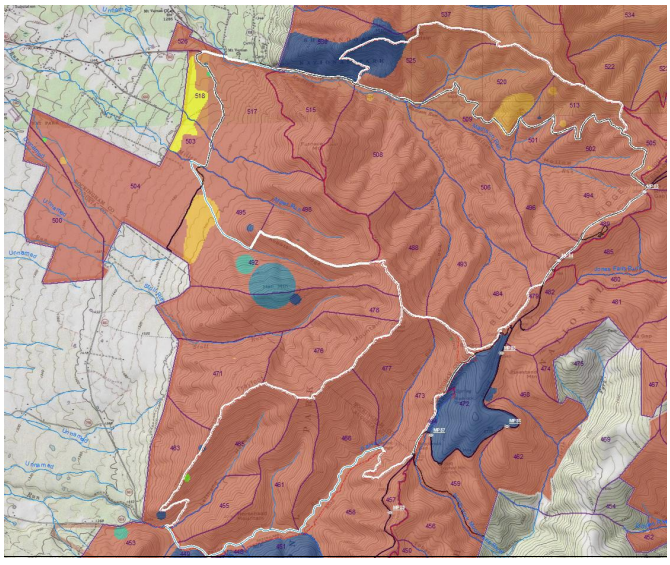

Figure 2. Years since last burned raster map generated from fire history polygons. Note the circular areas that were derived as circular buffer polygons from fire history points. Also shown are lines depicting search and rescue compartments (purple), fire planning units

Fire history maps were represented as polygons of historic fires (1925-2009) coded with year burned, and a point map representing additional fires as centroids with attributes of years burned and fire control acres. We created polygons around the fire centroids equivalent in area to the recorded acreage burned. We converted all fire history polygons to a raster representation and combined them such that we could calculate for every 17x17 meter pixel (ground area) in the park 1- the most recent year burned (Figure 2), 2- the number of times burned (or whether the area has never burned) since fire records were kept (1925), and 3- the average return interval in years between fires.

We used a GIS weighted overlay method in ArcGIS to rank and combine layers into a prioritization model. The weighted overlay method assigns a relative importance to each value on input layers (eg. ranked from 1-9), and then combines layers together using a common measurement scale. Weights can be given to different layers to change the relative importance to the final prioritization. We used two equally weighted inputs in

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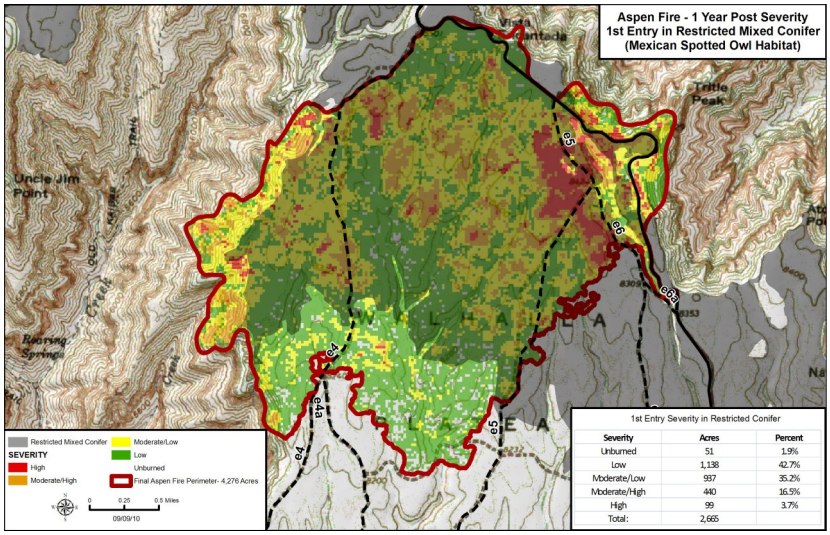
Monitoring Trends in Burn Severity, continued from page 8.

Map 2 Grand Canyon National Park, Burn Severity and Mexican Spotted Owl Habitat

GRCA also uses MTBS data when planning for prescribed fires. For example, MTBS data were used to determine that the 2003 Poplar Fire had burned with enough intensity to serve as a control line on the North side of the planned 2007 Roost Prescribed Fire, thus greatly reducing the need to install control line. Eliminating miles of control line allowed GRCA Fire Management to reduce the impacts on the landscape and reduce the overall cost of the project.

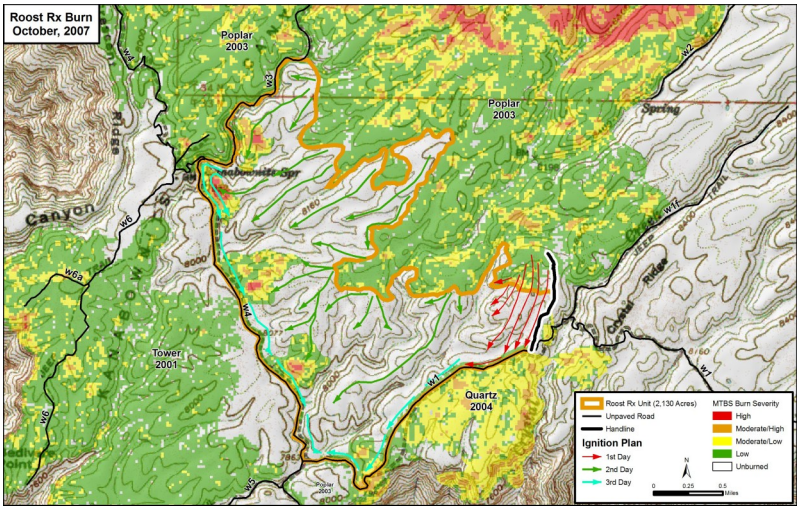


Burn severity and Mexican spotted owl habitat at Grand Canyon NP.

Map 3 Burn Severity Planning Map

Finally, Grand Canyon National Park is also using the MTBS data for several research projects. For example, GRCA has been working with Fort Lewis College in Durango, Colorado to use the MTBS severity data to create a fuels crosswalk to estimate the effects to the initial, pre-fire fuel data based on the burn severity class and the time since the fire. The results of this project will allow managers to have an accurate and dynamic fuels map, with updates based on the MTBS mapping data.

Other regions are also using the MTBS data sets. The Southeast Region (SER) is a good example of expanding the MTBS data sets and improving severity thresholds to meet park burn severity mapping needs. Although MTBS is currently mapping the burn perimeters and severity of all large fires for the eastern United States, the great majority of prescribed and wildfires that occur within southeastern National Parks are smaller than the MTBS area cutoff. Accurate burn severity estimates of these smaller fires are needed to improve the ability of managers to assess the landscape level effects of fire on pyrogenic ecosystems. To fill this unmet need, Josh Picotte of Tall Timbers Research Station was contracted to expand upon the data already provided by MTBS and create fire atlases for SER parks that included burn perimeter and severity imagery for fires more than100 acres from 1984 to the present, with the exception of Everglades and Big Cypress. Josh has subsequently mapped all fires greater than 100 acres for the Northeast (NER) and National Capital (NCR) regions. And since Josh used MTBS mapping protocols, MTBS was able include the smaller fires as part of its data sets and make them available on the MTBS website. We anticipate that information provided within the SER, NER, and NCR fire atlases and on the MTBS website will be widely used in future research applications and land management decisions.



Burn severity planning map of the Roost Rx Burn, October 2007.

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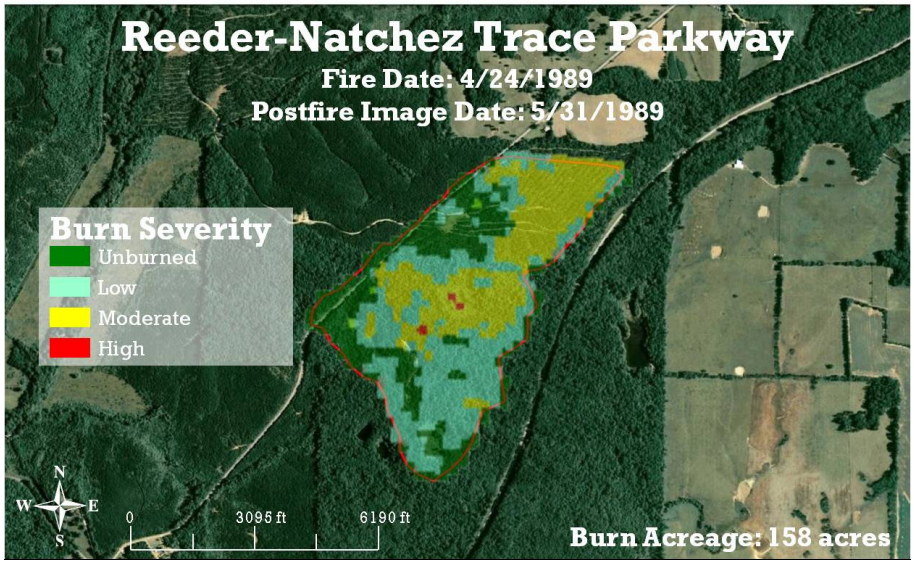
Monitoring Trends in Burn Severity continued from page 10.

Map 4 Burn Severity of Reeder-Natchez Trace Parkway April 24, 1989 Fire



Burn severity map Reeder fire Natchez Trace Parkway.

Much of the determination of the low, moderate, and high burn severity thresholds on MTBS burn severity products is done by trained remote-sensing analysts' visual interpretation. The burn severity thresholding process is therefore somewhat subjective and based on the prior knowledge and skill of the person performing the analysis. To provide more objective low, moderate, and high burn severity breakpoints for the unique vegetation community types in the Southeast, all available burn severity Composite Burn Index (CBI) plot data have been compiled into a FFI database. CBI data can be compared to different remote sensing indexes MTBS uses to map severity, e.g. NBR, dNBR, and RdNBR, to calculate the appropriate burn severity breakpoints. All SER burn severity breakpoint information will be given to MTBS analysts to assist in the thresholding of burn severity imagery for future fires. MTBS is also working with the National Park Service to develop a centralized CBI database that will be available through the MTBS website.

For more information on MTBS or to download burn severity mapping products, go to http://www.mtbs.gov/

Joppa Church Prescribed Fire, Mammoth Cave National Park, CBI Plot Photo (06/09/2010)

To see photos of different levels of severity in burns throughout the United States go to the Composite Burn Index (CBI) Photo Series: http://www.nrmsc.usgs.gov/science/fire/CBI.

If you would like more information about MTBS and burn severity in the National Park Service contact Nate Benson (nate_benson@nps.gov). If you would like more information about the southeastern National Parks fire atlases, CBI database, or MTBS e-mail Josh Picotte (jpicotte@usgs.gov). Josh now works at USGS EROS on the MTBS project. If you would like more information on how Grand Canyon uses MTBS data, contact Eric Gdula (eric_gdula@nps.gov).

Fire Management Prioritization Modeling Methodology, continued from page 9.

this draft modeling effort, vegetation fire tolerance and years since last burned. We first recoded the years since last burned into three classes (< 5 years, 5-15 years, > 15 years), and gave each class a relative ranking for prioritization (1, 9, and 5, respectively). We reasoned that areas burned less than 5 years ago were already within their desired fire return interval and would not need immediate attention while areas that burned between 5 and 15 years ago were the highest priority since they would need to be reburned soon to maintain their desired fire return interval. Areas that burned longer than 15 years ago were given higher priority than areas recently burned, but lower priority than areas burned from 5-15 years ago. We assigned relative rankings for vegetation fire tolerance, prioritizing those vegetation communities that were most fire tolerant (fire tolerances 1,2,3,4,5 were ranked 9,3,1,1,1 respectively). The weighted overlay methods combines the ranked input layers (Figure 3) and results in an output layer where each pixel is assigned a ranking from 1-9 that is a combination of the input rankings. This is the same method used by Hiers et al. (2003) for prioritizing prescribed burning areas, but their model had 11 input criteria derived from group meetings with managers and biologists. Areas assigned a "9" on the output map are highest priority for fire management on both vegetation fire tolerance criteria and years since last burned criteria.

We produced maps of the weighted overlay output at the pixel level, and summarized the outputs by fire planning "compartments" represented by search and rescue polygons previously defined for the park. We used search and rescue polygons as fire planning compartments because 1) they are defined along ridgetops, streams, roads, and trails which are natural firefighting boundaries, 2) the search and rescue units are of a reasonable size (average 316 acres) for planning burn units, 3) the units are inclusive of the entire park, and 4) park GIS staff had already expended considerable effort in their definition. There were 627 search and rescue compartments defined for the park. We summarized and

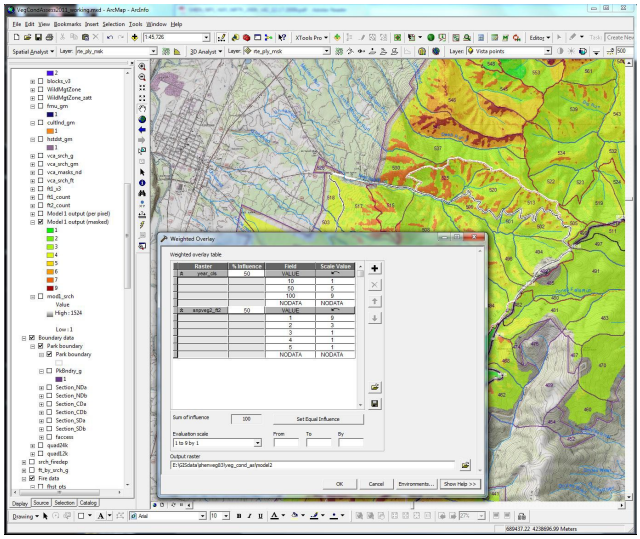


Figure 3. Weighted overlay GIS method as implemented for draft fire management prioritization model results.

mapped the acreage in the two highest priority model output classes by search and rescue grid (class 9 and class 7, there was no class 8 on the output maps).

We created GIS "masks" or exclusion areas by creating raster layers from polygon maps of fire exclusion (FMU) zones, historic districts, cultural zones, and by creating 20-meter buffer polygons around rare species point and polygon layers. Raster pixels that fell within these exclusion zones were set to zero value and were not included in acreage summaries or on maps depicting burn priorities.

This is only a draft result for prescribed fire prioritization in SHEN. Additional data layers could be prioritized and combined using the weighted overlay method, or priorities of existing layers could be re-ordered and the model re-run. Outputs of this effort could help to prioritize both the amount of area in need of fire management as well helping to define the precise geography of potential burn units. Prioritization of the use of prescribed fire to manage vegetation at SHEN is only a first step. In particular, park managers want to understand if prescribed fire is producing the desired result (e.g., regeneration of appropriate vegetation associations).

Training for Resource Advisors Enhances Resource Protection during Incidents

Richard Schwab, National Burned Area Rehab Coordinator

Attendees of the NER 2011 READ class

In April of 2011, fifty-three people completed the Incident Resource Advisor Training hosted by Shenandoah National Park in Luray, Virginia. The course gave participants the background to serve as Resource Advisors (READs) during wildland fires and all hazard incidents. READs work with Incident Command Teams and fireline personnel to minimize the impacts of fire, fire management activities and post-fire conditions to natural and cultural resources. READs are also critical to begin identifying needs related to the repair of fire suppression impacts, Burned Area Emergency Response (BAER) and Burned Area Rehabilitation (BAR).

A small cadre from Pacific West Region and the Fire Management Program Center developed the sophisticated, well-received course. This spring, the training came east and 46 NPS employees were joined by 7 others from the U.S. Fish & Wildlife Service, the Forest Service and the Virginia Department of Forestry. The training cadre was enhanced with local experts on aspects of resource protection and incident management.

This course is part of a larger effort to bring together the fire and resource management communities. Courses have been held around much of the country and the plan is to conduct them in the Midwest and Alaska. Some attendees had previously served as Resource Advisors on the Deepwater Horizon incident. They recognized the training would have helped them be more effective working in the incident command structure which guided the response to the oil spill.

The resource protection component of the NPS mission uniquely positions the NPS to lead the Resource Advisor field and define the roles and responsibilities of the READ in the coming years. The READ position and by extension this curriculum, provides a model of inter-disciplinary cooperation which benefits the resources we are charged to protect for the good of the American people.

Class participants on a field trip to the 2011 Smith Run wildfire.

Post Fire Programs

By Richard Schwab

While many wildfires cause minimal damage to the land and pose few threats to the land or people downstream, some fires cause damage that require special efforts to prevent problems afterwards. For example, a loss of vegetation may expose soil to erosion; water runoff may increase and cause flooding; sediment and debris flows may move downstream and damage houses; or invasive species may increase. The Burned Area Emergency Response (BAER) program is designed to address these situations through its key goals of protecting life, property, and critical natural and cultural resources.

The two post-fire program funding activities are emergency stabilization and burned area rehabilitation. Emergency stabilization projects are for urgent situations to protect life and property. This stabilization work begins before the fire is out and may continue for up to a year. Longer-term non-emergency restoration efforts are funded by the burned area rehabilitation activity and focus on lands unlikely to recover naturally. Burned area rehabilitation projects may be funded up to three years.

Although 2010 was considered to be a relatively quiet fire season, the National Park Service had eleven emergency stabilization projects that amounted to nearly one-half million dollars. In addition, twenty-four burned area rehabilitation projects totaled over $1,666,000.

A recently completed project that we would like to highlight is at Zion National Park. The 2007 Dakota Hills fire burned nearly 6,000 acres and a Burned Area Emergency Response Team recommended a landscape scale application of the herbicide imazapic to suppress post-fire invasive species, primarily cheatgrass (*Bromus tectorum*). Cheatgrass has become a chief concern because it changes fire regimes and increases fire return intervals. It should be noted that in 2007, the Department of the Interior expended nearly $70 million on invasive treatments for species such as cheatgrass after the record fire seasons of 2004 through 2007.

To study the effectiveness of the herbicide, Zion resource managers formed an exceptional collaboration with Northern Arizona University through a Cooperative Ecosystem Study Unit agreement, and the Joint Fire Science Program. The study demonstrates the need to use science-based adaptive management to make future sound management decisions. Since implications of large-scale applications of the herbicide to burned landscapes are not fully understood, this project monitored the effectiveness in suppressing the post-fire invasion of cheatgrass and evaluated changes in the native understory plant community.

MaryBeth Garmoe, a student at Northern Arizona University's School of Forestry and now a NPS employee at Grand Canyon National Park, is the primary author of the study. Her results indicate that while the selected herbicide initially reduced cheatgrass biomass, the effect of the herbicide on

Pictured from left to right, NAU students, Karen Weber, Marybeth Garmoe, and Hondo Brisbin. Photo by Andi Thode

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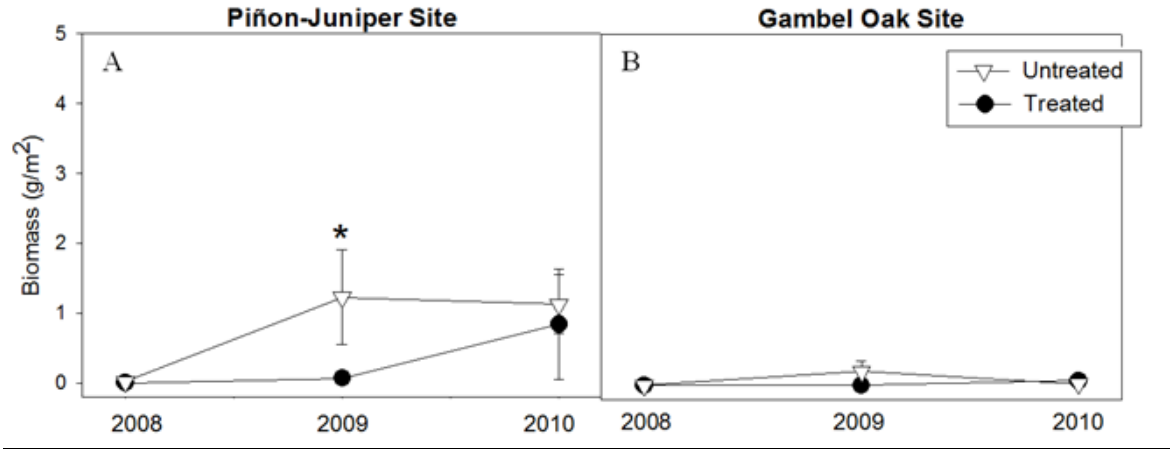
Post fire programs, continued from page 14.

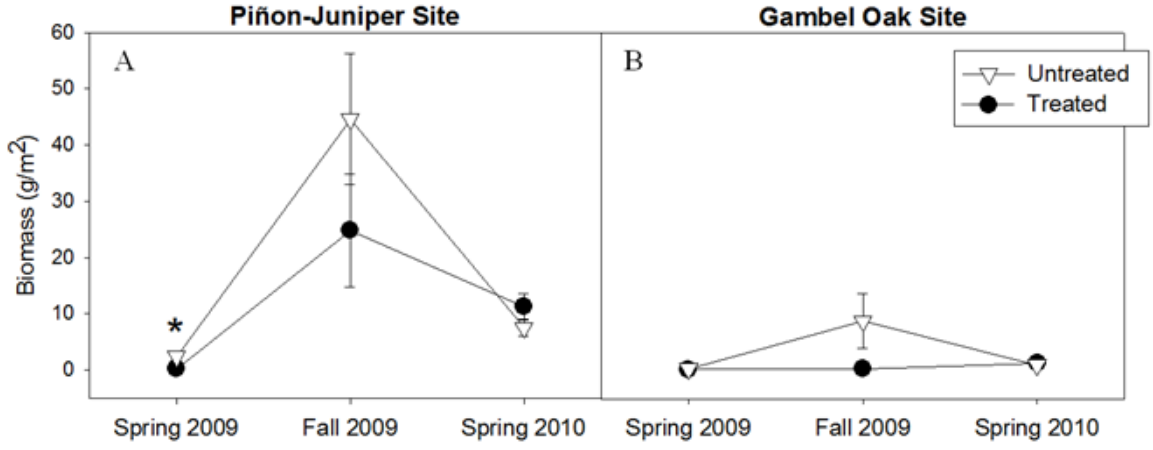
cheatgrass is greatly diminished by the end of the three year study. This information is critical for managers such as Kristin Legg, Chief of Resources at Zion National Park to use in making future decisions. Cheryl Decker, a botanist at Zion National Park and one of the leads of the project, was instrumental in seeing the project through to the end. According to Decker, "While this treatment was not the silver bullet we were all hoping for, we learned a great deal from it and we are incorporating that knowledge into other cheatgrass control projects."

Although the long term effectiveness of the selected herbicide may diminish, fire and resource managers at Zion National Park continue to explore other strategies to reduce cheatgrass. They are now working on reducing cheatgrass populations in Zion Canyon, focusing on high visitor use areas such as campgrounds, the lodge, and the visitor center. One technique showing some early success is combining prescribed burning, to reduce the amount and viability of the cheatgrass seed, and then following it with pre-emergent herbicides. By using science to investigate the efficacy of the treatments, we may determine other effective management strategies.

The Burned Area Emergency Response program is always looking for interested individuals to become members of BAER Teams. Needed are resource professionals with knowledge of hydrology, botany, zoology, soils, endangered species, and cultural resources. For further information, contact Richard Schwab at richard_schwab@nps.gov



Cheatgrass Graph of Treatment Results



Prickly Lettuce Graph of Treatment Results

Fire Effects Photo Contest

There is only one category, something having to do with fire effects. Photos can be of cool plants, field-weary monitors, fire employee babies—the possibilities are endless.

This edition's winner: Jillian Post

Photo of a male Karner Blue Butterfly, endangered butterfly for who suitable habitat is restored and maintained in part by fire.

RxFx Subscription and Submission Information

Rx Effects is the newsletter of the Fire Ecology Program in the National Park Service. It is an outlet for information on Fire Effects Monitoring, FMH, fire research and other types of wildland fire monitoring. The newsletter is produced annually for the National Park Service but we encourage anyone with an interest in fire ecology to submit information about their program or research. Examples of submissions include: contact information for your program, summaries of your program's goals, objectives and achievements, monitoring successes and failures, modifications to plot protocols that work for your park, hints for streamlining collection of data, data entry and analysis, and event schedules. Submissions are accepted in any format (e.g., hard copy through the mail or electronic files through e-mail). Please see our website for author instructions. The goal of the newsletter is to let the Fire Effects Monitoring community know about you and your program.

Rx Effects is issued each year in the spring. The **deadline for submissions is the last Friday in February.** If you would like a subscription or more information please see our website **www.nps.gov/fire/fire/fir_eco_rxeffects.cfm** or contact:

Missy Forder
3655 US Highway 211 East
Luray VA, 22835
(540) 999-3500 ext. 3323
melissa_forder@nps.gov

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