RxEffects

National Park Service
U.S. Department of the Interior

Fire Ecology Program

Glade coneflowers on rx maintained dolomite glade, Missouri Ozark region. Photo by Susan Farrington.

Volume I, Issue 13 *Fall 2014*

Inside this issue:

****New Editor Wanted****
2- year commitment (2 issues)
If interested, please submit your name by Nov. 30, 2014 to:

Marybeth Keifer
(603)-795-2333
marybeth_keifer@nps.gov

Discussion Topic: Essential Fire Ecology

Authors (alphabetical):
Diane Abendroth, Fire Ecologist, Teton Interagency Fire
Windy Bunn, Fire Ecologist, Grand Canyon National Park
Sherry Leis, Fire Science Program Leader, Missouri State University
Rebecca Smith, Fire Ecologist, Yellowstone National Park
Dan Swanson, Fire Ecologist, Northern Great Plains Park Group
Kathleen Walsh, Lead Fire Effects Monitor, Zion National Park

Lately the future of the fire ecology program in the NPS has become precarious. Park and Regional Fire Ecologist vacancies have gone unfilled. Future target organizations indicate less emphasis on monitoring programs, with vital assistant crew lead positions no longer included. The draft National Park Service Wildland Fire Strategic Plan for 2014 – 2019 no longer includes using a science based approach as a guiding principle. At the Washington level, the DOI National Fuels and Fire Ecology Program no longer exists by this name, and has become part of "Landscapes and Partnerships." The word "ecology" is missing from the goals of the Cohesive Strategy.

At the root of this change is federal budget reduction, which challenges our leaders to make tough choices about our mission objectives and priorities. While ecology is not the first word that comes to most people's minds when asked about wildland fire, fire ecology programs with professional ecologists and dedicated monitoring crews are essential to the NPS mission. The 2012 Revisiting Leopold Report of the NPS Advisory Board Science Committee calls for increased reliance on science in decision-making and an expanded scientific capacity of park employees in the coming years. It also recommends an expanded role for monitoring as an essential component of managing for coming changes. Director's Orders RM-18 requires monitoring within the fire program, and monitoring is key to the success of adaptive management.

There are several types of monitoring programs that parks within NPS can take advantage of including the Inventory and Monitoring (I&M) program and the Fire Effects Monitoring Programs. While the I&M program has an important role to play in understanding long-term trends, their mission is not about assessing the effectiveness of management actions. The fire management program is well suited to provide a direct understanding of management actions. Unfortunately,

Essential Ecology continued from page 1

regional offices have been reducing monitoring capacity leaving individual parks to rely on less suitable programs or intuition to understand the results and effects of planned and unplanned fires.

FIRE ECOLOGY PROGRAMS PROVIDE EARLY WARNING OF UNINTENDED OUTCOMES AND OPPORTUNITIES FOR CHANGE

Prescribed fires, wildfires with resource objectives, and other fuels treatments are expensive, they have risk, and they impact park resources in both positive and negative ways. In order to achieve the NPS mission, these activities need to be evaluated over the long term to measure their success, detect unforeseen outcomes, and learn ways to make improvements. We need to monitor our actions and effects so people of the next generation aren't left mitigating for impacts we did not notice (such as the ecological burden of our former 10:00 AM Policy). Without monitoring and evaluation, we will be flying in the dark, not knowing whether our activities are benefitting ecosystem diversity and function or inadvertently leading to degradation.

FIRE ECOLOGY PROGRAMS ARE A CRITICAL LINK BETWEEN RESEARCHERS, RESOURCE MANAGERS, AND FIRE MANAGERS

Fire Ecology Programs link operational fire to the NPS mission and are the foundation for successful fire management planning at the park level. Park Fire Ecology personnel have a unique combination of skills and perspectives. On one hand, they are scientists, who track current research and understand the biological and chemical processes of fire disturbances. But they are also firefighters who know the practical aspects of putting fire on the ground and the risks associated with its behavior. Fire ecology programs are the bridge between NPS resource stewardship and fire risk management. They are able to explain fire effects and control options to the resource manager and ecosystem responses to the fire manager. This dual capability is vital to connecting restoration and fuels reduction; researchers and managers; and NPS divisions. NPS Fire Ecologists also communicate with the academic community, bringing forth research requests spawned by monitoring results and management dilemmas.

FIRE ECOLOGY PROGRAMS PROVIDE THE SOUND SCIENTIFIC BASIS TO MANAGE THE COMING CLIMATE CHALLENGES

Fire ecology programs were once primarily concerned with demonstrating the value of fire disturbances and their role in the ecosystems we are charged with managing and protecting. Now our fire regimes are better understood and the importance of fire is widely accepted. This does not mean the work of fire ecology programs is done. With changing climates, fire regimes are changing as well. Restoration of historic fire intervals may now be an outdated goal. A new set of goals will be needed for fire managers in the coming decades. Those goals will be more challenging than generating black acres or restoring natural disturbances and will require a more advanced understanding of ecological processes. NPS fire ecology programs must adapt as well, and provide a sound scientific foundation for the coming challenges of fire management. Adjustments to fire return intervals, seasonality, and fire

Cheatgrass and Japanese brome dominate this landscape at Scott's Bluff National Monument.; Managers plan to use a combination of prescribed fire; herbicide; and native seed planting to restore the community.; Pre-burn monitoring shows 97% exotic grasses.; Monitoring results following the treatments will help demonstrate the efficacy of the restoration and fine-tune how the suite of treatments is applied in adjacent areas.

The wildflower pictured above is tall larkspur (*Delphinium exaltatum*), a nationally rare species. While it is believed that it responds favorably to fire, the Ozark National Scenic Riverways now has fire effects monitoring data showing the plant thriving after prescribed burns. The park's Pistol Barrel prescribed burn unit has the second largest documented population of tall larkspur in the nation and the largest population under prescribed fire management anywhere. A spicebush swallowtail butterfly is feeding on nectar in the photo above, taken by Angela Sokolowski.

Essential Ecology continued from page 2

intensity are just a few things that will need to be considered by fire management programs in preparing for climate change. The fire ecology program provides current and science-based information to park staff so fire activities will retain native ecosystem components and core functions. Fire effects monitoring must also adapt to changing objectives and ecosystems. For example, as exotic species threats increase, protocols for early detection of postfire invasions may be needed.

FIRE ECOLOGY PROGRAMS INCREASE PUBLIC SUPPORT FOR FIRE MANAGEMENT ACTIVITIES

Another way Fire Ecology professionals can adapt is through the discussion of emerging resource goals. In the Cohesive Wildfire Management Strategy, the concept of "resilience" is stated as an overarching goal. This concept is currently vague, and could refer to social as well as natural systems. Parks are charged with developing measures of resilience, and our performance for the agency and the public's support will depend on these reported outcomes. Our call to action is to claim the term "resilience" as a measurable attribute of fire effects on the landscape. Fire ecologists need to be at the table when new language is defined to make it relevant for both land managers and the public.

Gone are the days when managers simply walked through a completed prescribed fire area and observed 'the good they've done'. They must be able to document and communicate specific objectives to the public, and then adjust tactics for an even better result in the future. The Park Service has always taken pride in science-based fire management decisions; and its managers continue to need concrete data to strive to understand the range of effects from management decisions.

In summary, the NPS fire ecology program serves multiple stakeholders. Our monitoring data and analyses contribute to park natural resource monitoring programs, fire management operations, and public understanding of fire, natural resources, and national park missions. This critical service, if lost, will result in decisions being made on guess work rather than sound science. As a result, the wrong management actions could be chosen and public trust eroded. We have a duty to continue to meet the public's information needs through the fire ecology program.

Interested in discussing this article?

See the NPS Intranet Sharepoint for Fire Ecology Discussion Board at http://share.inside.nps.gov/sites/mwrfire/ecology/default.aspx

REFERENCES

National Cohesive Wildand Fire Management Strategy. http://www.forestsandrangelands.gov/strategy/

Draft NPS Fire Management Strategic Plan (2013)

United States Department of the Interior, National Park Service. 2008. Director's Order 18: Wildland Fire Management.

United States Department of the Interior, National Park Service. 2014. Reference Manual 18: Wildland Fire Management.

Revisiting Leopold: Resource stewardship in the National Parks. 2012. National Park System Advisory Board Science Committee. Available at: http://www.nps.gov/calltoaction/PDF/LeopoldReport_2012.pdf

Prescribed Fire was successfully used in this mixed conifer forest at Grand Canyon National Park to create low severity effects to thin the understory without killing overstory trees. Fire effects monitors collected observations of weather and fuels conditions during the burn, which have been used to refine prescriptions for upcoming prescribed fire units. Vegetation and fuels data from 20 plots showed that large downed woody fuels were reduced by 30%, seedling trees were reduced by 48% and 27% of conifer saplings were killed. No overstory conifers were lost in any of the plots.

Grand Teton National Park has completed numerous mechanical thinning projects near campgrounds and housing areas to make them more defensible in the event of a fire. Since visitors and residents enjoy the privacy and shade of these forests, Fire effects monitoring has been used to determine how much thinning is needed to achieve desired fire behavior changes. The post-thinning scene above is natural looking, but projected surface flame lengths are only 1.5 feet under 97th percentile fire weather and wind speed would have to be over 37 mph to sustain a crown fire.

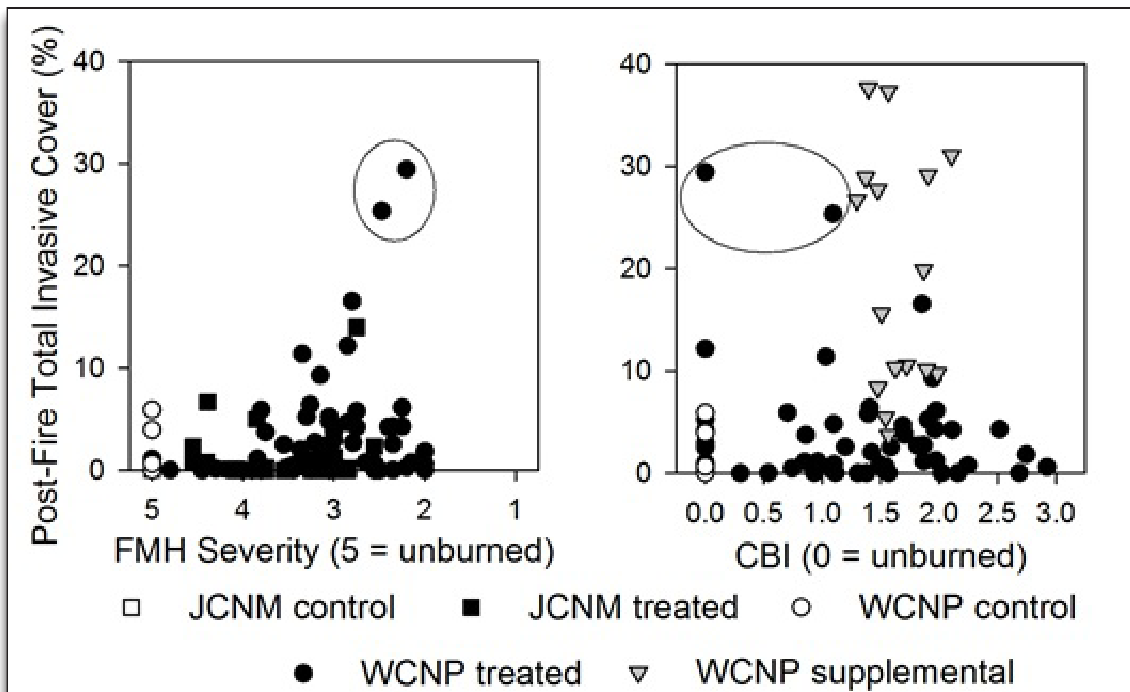
Strategies to Quickly Find Invasive Plant Outbreaks after Prescribed Fire in Black Hills Ponderosa Pine Forest

Amy Symstad, Research Ecologist, and Wes Newton, Statistician, Northern Prairie Wildlife Research Center, U.S. Geological Survey

Dan Swanson, Northern Great Plains Fire Ecologist, National Park Service

Prescribed fire is an important tool for restoring and maintaining forest structure and health in the ponderosa pine (*Pinus ponderosa*) forests of South Dakota's Black Hills. In forests with a long history of fire suppression, burn prescriptions may target higher than usual severity in order to reduce not only ladder fuels, but also canopy density. However, this practice may increase the risk of post-fire invasive plant outbreaks, as it releases nutrients in litter, duff, and understory vegetation and provides new light to the forest floor when it opens up the canopy. Natural resource managers in Black Hills NPS units sought quantitative information on invasive plants and prescribed fires to better weigh the pros and cons of using more severe prescribed fires in overly dense forests. Previous experience led them to assume that any prescribed fire would lead to an increase in invasive plant abundance, so they also desired information that would lead them to where those outbreaks were most likely to occur. This would enable a more efficient use of their limited resources for finding and controlling troublesome invasive plants.

Thus, with the financial support of the Research Reserve Fund and the logistical support of the Northern Great Plains Fire Management Office, we conducted a three-year research project in two Black Hills parks, Jewel Cave National Monument (JECA), and Wind Cave National Park (WICA). [We initially included a third park, Devils Tower National Monument, but had to drop that one when the planned prescribed fire did not occur within the funded timeframe.] Our ultimate goal was to answer the question, "What practical strategies can be used to quickly find invasive plant outbreaks following prescribed fire in Black Hills ponderosa pine forest?" The short answer appears to be, "Concentrate in areas that were problem spots before the fire and on more severely burned areas." Some important caveats, though, are that this works better for some species than others, pre-fire problem spots are not well predicted by the environmental characteristics we measured, and not all severely burned areas will have invasive plant outbreaks.



Post-fire total invasive cover vs. fire severity for individual plots by plot type, measured at the ground level using Fire Management Handbook protocols (left) or at the canopy level via the satellite-derived composite burn index (right), which was available only for WICA. Circled plots had unusually high invasive cover before the prescribed fires.

Finding invasives continued from page 4

Project details are in a manuscript we recently submitted to Forest Ecology and Management, so we'll provide just a brief summary here. Our research approach was to measure easily identifiable environmental characteristics – forest structure; general understory vegetation composition; slope position, aspect and grade; vegetation type; distance from roads, major trails, or other development – plus the abundance of 20 invasive plant species before and after prescribed fires in 28 plots inside the JECA burn unit (including 1 unburned control), 57 plots inside the WICA burn unit, and 6 control plots outside the WICA burn unit. We also calculated four indices of fire severity, two indicating surface fire severity and two indicating canopy fire severity. We then used an information-theoretic model selection approach to determine which combination of environmental and fire severity variables best explained individual invasive species and total invasive species cover two growing seasons after the fall, 2010 prescribed fires. In that second growing season (2012), we also did some measurements in "supplemental" plots – plots we deliberately located in areas with very high invasive cover. These supplemental plots couldn't be used in our statistical analyses, but they provided some anecdotal insight not available from the randomly located plots, which by chance missed the most severe invasive outbreaks.

We found ecologically meaningful models for post-fire cover of all the invasive species combined, as well as for the two most common species individually. Post-fire Canada thistle (*Cirsium arvense*) and total invasive cover were greater in areas with less dense pre-fire forest structure, further from roads, and that experienced higher surface fire severity. The model describing post-fire common mullein (*Verbascum thapsus*) was similar, except that pre-fire forest structure was not important. The positive relationship between invasive cover and distance from roads (after accounting for pre-fire forest structure and fire severity) was surprising, since the conventional wisdom is that invasives are more abundant close to roads and other development, which bring disturbance and propagules. We wonder if the spatial distribution of higher-severity fire caused by the helicopter ignition used in the remote areas of the WICA burn unit (see Dan Swanson's article in the Spring 2012 RX Effects) might explain this relationship.

The environmental and fire severity factors we measured explained 24-34% of the variation in the post-fire cover of thistle, mullein and all invasives combined. So, although the models we developed to predict post-fire invasions suggest a search pattern that is better than just randomly wandering around the burned area, they won't lead weed teams to all the

Common mullein (foreground) and Canada thistle (mid-ground) in a highly invaded plot two years after prescribed fire at WICA. Our data suggest that a high cover of exotic species post-fire is more likely in areas with higher burn severity.

infested areas. For thistle, especially, but also for all invasives together, a factor that's better at explaining post-fire cover is pre-fire cover: 71% of variation for thistle and 45% for all invasives. This relationship wasn't true for mullein, whose pre- and post-fire cover were not strongly related ($R2 = 0.06$). So, knowing where the thistle is before a fire should help a weed crew find many of the areas where it will probably be even more abundant after the fire, but looking in more severely burned areas is probably a better strategy for finding mullein outbreaks. In fact, our supplemental plots suggest that targeting high-severity areas will have the greatest pay-off in finding the most severe outbreaks except when pre-fire cover was high (see figure). As mentioned above though, the factors we measured were not great at explaining where thistle was before the fires ($R2 = 0.19$), and not all high-severity areas had high invasive cover.

The fact that post-fire invasive cover tended to be higher in higher-severity areas does suggest that fire and resource managers need to consider the risk of invasive plants when planning prescribed fires. However, if measures to reduce these outbreaks (perhaps pre-fire treatment, or post-fire seeding with desired native species) are economical, then including a mixture of fire severities in burn prescriptions could be a useful tool for restoring a more heterogeneous, pre-suppression-like structure to Black Hills ponderosa pine forest.

Fire Induced Tree Mortality Following Lightning Ignition in the Ouachita Mountains, AR

By Virginia McDaniel, Southern Research Station

In 2011, the southern United States experienced a severe drought that resulted in extreme fire danger. In the Ouachita Mountains of southwestern Arkansas, more lightning-ignited fires occurred than in any other year in recorded history (66 years). Most fires were contained with full suppression, but one lightning ignition occurred in a remote and rugged area of the Ouachita National Forest (near High Peak). In the interest of restoring the natural role of fire to the landscape, and ensuring firefighter safety in the inaccessible terrain, managers decided to manage the fire within a designated containment area of 1500 acres (i.e. manage the fire with less than full suppression). The High Peak Wildfire (Fig. 1) burned from 29 July to 11 August 2011. Given the hot, dry conditions, however, there was concern that overstory tree mortality might exceed the Forest's desired future condition for forest structure.

In a collaborative study between the Southern Research Station, Ouachita National Forest and TNC of Arkansas, we randomly generated 50 points within the High Peak Wildfire containment area (Fig. 2). We visited each point directly after the fire and installed 10-meter radius circular plots in burned areas (32 plots). Plots were not established in unburned areas. On each plot we identified and measured all trees over 2.5 centimeters DBH and determined scorch height, percent crown scorched, char height, and live or dead status. Since we were unable to collect pre-burn data, we used immediate post-burn conditions to reconstruct the pre-burn composition of live versus dead trees. Burn severity of ground-truthed plots was determined by percent overstory (OT) scorch (<25% OT scorch = low; >25% OT scorch = low to moderate; if <80% of a plot burned it was considered a partial burn). We then compared our burn severity estimation with a satellite-derived burn severity map (BARC -Burned Area Reflectance Classification) created by the Forest Service Remote Sensing Applications Center (Fig. 2). We used species composition data to determine forest type (hardwood – 9 plots, pine-oak – 18 plots, and pine plantation – 5 plots). All plots were re-measured one-year post-burn to determine mortality and changes in tree composition.

Figure 1: High Peak Wildfire.

Tree Mortality

Plots had an overall tree mortality of 51% (966 stems/ha) (Fig. 3). Overstory stem density (>15 cm DBH) was re-

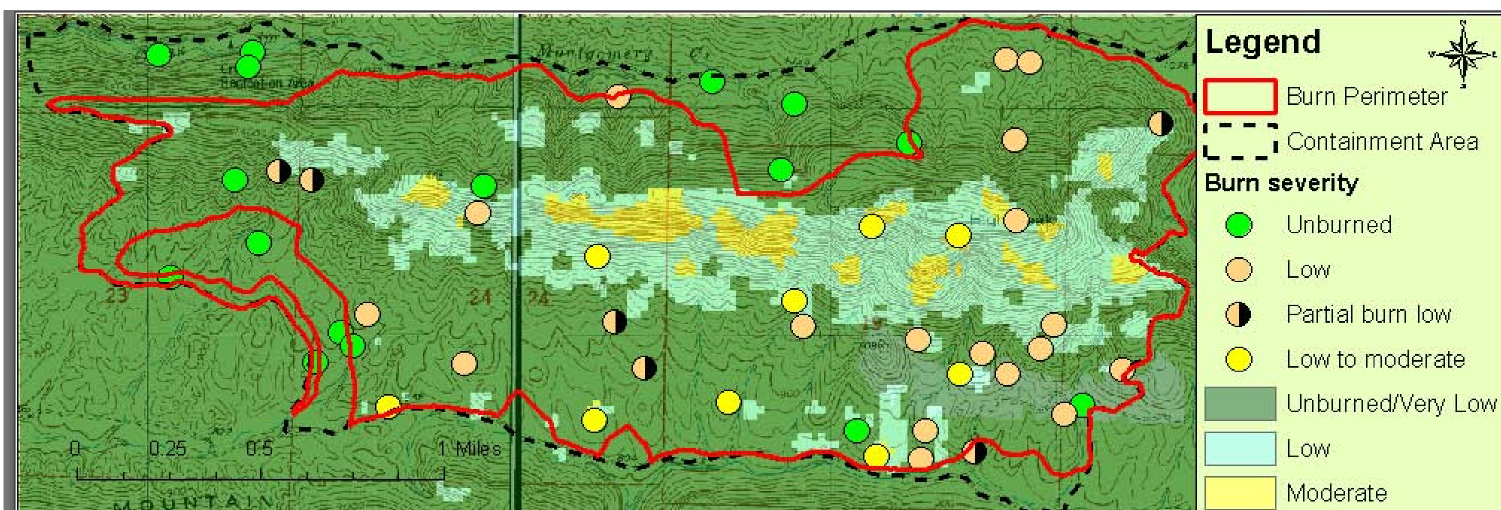


Fig. 2: Satellite-generated burn severity map of the High Peak Wildfire with point burn severity determined by ground-truthed plots.

Tree mortality continued from page 6

duced by 5% (23 stems/ha) (Fig. 4) and sapling stem density was reduced by 64% (943 stems/acre) (Fig. 5).

Forest Type

While pine plantations had significantly more trees than hardwood and pine-oak forests, stem density was reduced nearly equally in all forest types (hardwood – 42 %, pine-oak – 47%, and pine plantation – 49%) (Fig. 6).

Weather and Fire Behavior

In spite of low relative humidity (average = 27%), high temperature (average = 104 degrees F) and high KBDI (Keech Byrum Drought Index; average = 704), fire intensity on the High Peak Wildfire was low (flame lengths mostly 8 inches to 2 feet) (Fig. 7). While there was the occasional head fire in a drainage, most of the fire was backing or flanking.

BARC Imagery

BARC satellite imagery is a useful tool in determining burn severity maps of wildfires. Ground-truthed plots showed it to be fairly accurate (Fig. 2). In eastern forests, however, it is difficult to detect a difference between low burn severity and unburned areas using satellite imagery.

Conclusions and Future Plans

One-year post-burn, overstory tree mortality on the High Peak Wildfire was not significant and is consistent with the Forest's desired future condition for forest structure.

With the long term outlook for the Ouachita region including hotter and drier conditions, allowing fires to burn may provide resource benefits with less risk to overstory trees than expected.

We plan to re-measure plots in 2 and 5 years to determine any lag mortality and do further studies if managers continue to allow lightning ignitions to burn.

For more information, please contact Virginia McDaniel, vmcdaniel@fs.fed.us, 501-623-1180 X112, Hot Springs, AR.

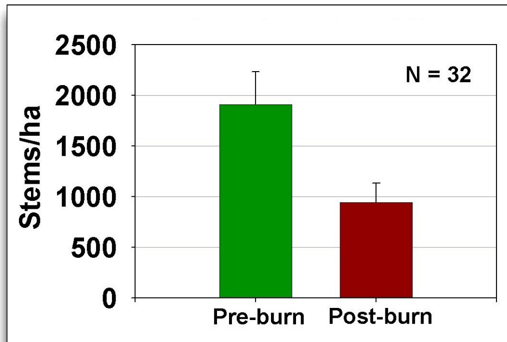


Fig. 3: Change in total live stem density between pre- and post-burn.

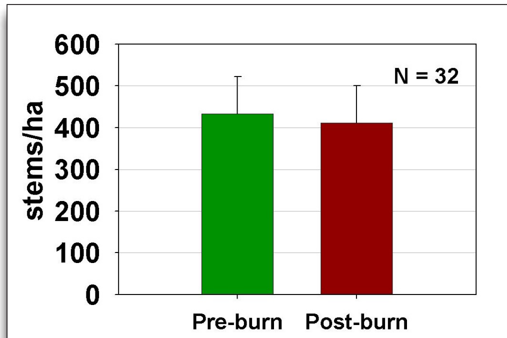


Fig. 4: Change in live overstory density (>15cm DBH) between pre- and post-burn.

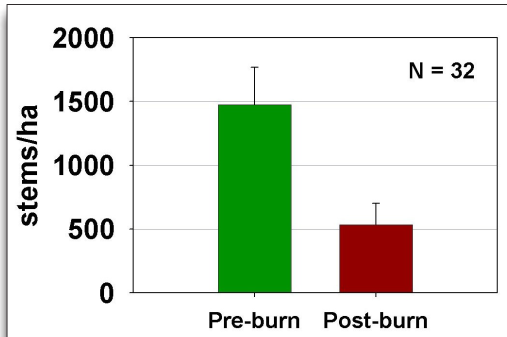


Fig. 5: Change in live sapling density (<15cm DBH) between pre- and post-burn

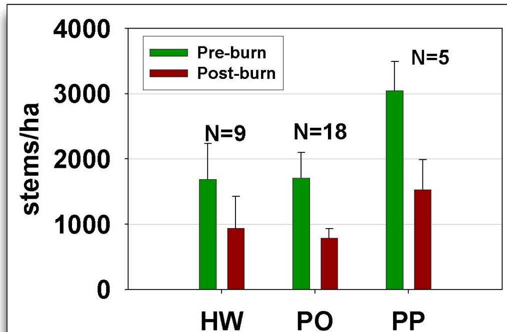


Fig. 6: Change in total stem density by forest type (HW=Hardwood, PO=Pine-Oak and PP=Pine Plantation).

Fig. 7: Typical fire behavior on the High Peak Wildfire.

Fuels Reduction to Protect 100 Year Old Historic Structures in Bering Land Bridge National Preserve, Alaska

Authors: Jennifer Barnes & Larry Weddle

Affiliations: Regional Fire Ecologist, Alaska Region National Park Service & Fire Management Officer, National Park Service, Alaska Western Area Fire Management

Located in northwest Alaska on the Seward Peninsula is Bering Land Bridge National Preserve -which has a long history of human inhabitance and a history of fire. More than 10,000 years ago people crossed from East Asia through the Bering Land Bridge, also known as Beringia, as a migration route into North America (http://www.nps.gov/bela/historyculture/index.htm). In addition to the ancient history, the area is steeped in mining history that began in the late 1800s (North to Alaska!). During the early mining era, buildings and infrastructure were built. Some of these historic structures are still standing and are vulnerable to wildfires. Large and small wildfires occur periodically on the Seward Peninsula and within Bering Land Bridge National Preserve (Fig. 1).

In approximately 1906 several cabins were built to support the maintenance of the 38 mile Fairhaven Ditch which was constructed to provide water for gold mines along the Inmachuk River drainage (Frank, W. 1986 Historic Resource Study: Bering Land Bridge National Preserve https://archive.org/details/historicresource00will). Portions of the Fairhaven Ditch and the structures are within Bering Land Bridge National Preserve. Fires have occurred in the area of the Fairhaven structures and the park was interested improving the ability to protect the cabins in the event of future wildfires and to help stabilize the structures from shrub encroachment. In 2012 the NPS Alaska Western Area fire management crew conducted a vegetation fuels reduction project around two of the historic Fairhaven Ditch structures in Bering Land Bridge (See Fig. 1). Vegetation around these cabins consisted mostly of tall willow, shrub birch, dwarf shrubs, and herbaceous plants (Fig. 2a). The goal of the fuels reduction was to reduce the tall shrubs around the cabins to better enable firefighters access to the site when the cabins need protection from a wildfire.

The specific fuels reduction objectives were to cut tall shrubs out to 50 ft from the cabins and to remove 80% of the tall shrub cover. Pre-treatment monitoring data was collected just prior to the fuels treatment and re-measured immediately post treatment in mid-June of 2012. Four 16-m transects were established to document shrub reduction in the treatment area to evaluate the success of the hazard fuels treatment in meeting prescription objectives.

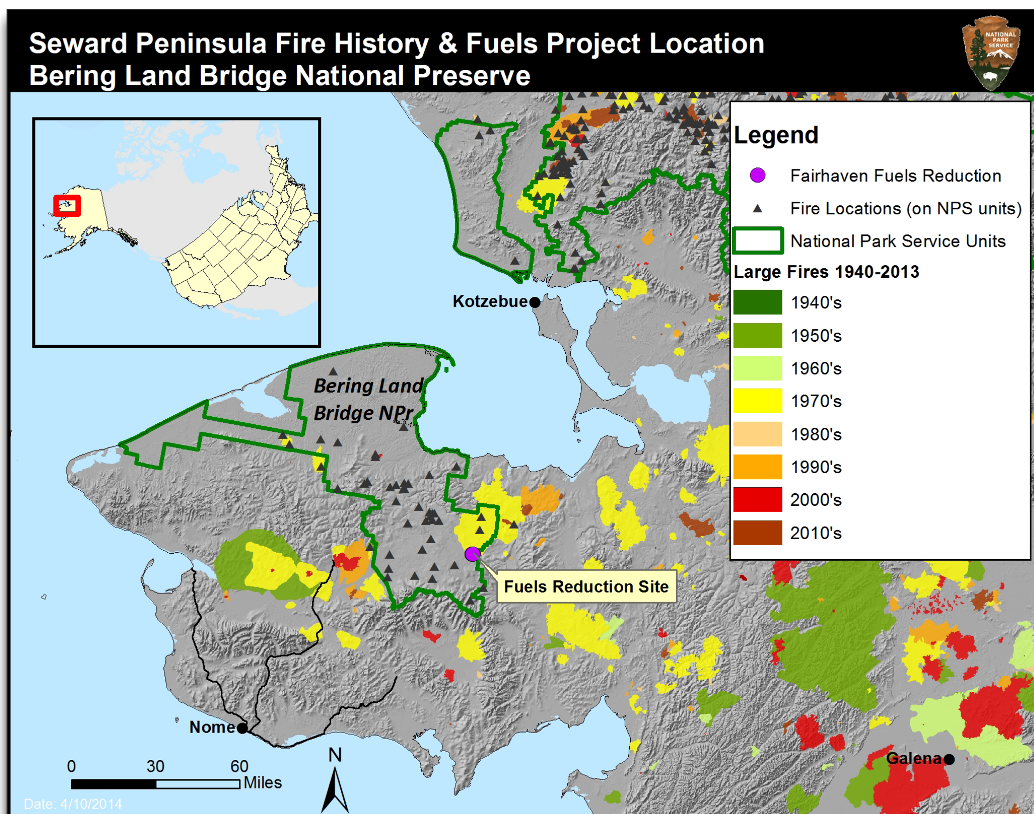


Figure 1. Fire history from 1940-2013 on the Seward Peninsula and within Bering Land Bridge National Preserve.

Based on the 2012 monitoring plots, the prescribed reduction of tall shrub cover was nearly met with a 66% reduction in tall shrub cover. Two of the monitoring transects (Fair-01 and Fair-03) extended beyond the cleared area (Fig. 3), therefore the shrub reduction percentage was actually higher within the cleared area. The dominant tall shrubs (birch and willow) were reduced from 78.1% (69.3 - 87.0% (80% CI)) to 26.6% (13.6-39.5%

Figure 2a. Dense tall shrubs surrounded the historic Fairhaven Cabins in Bering Land Bridge NP prior to the fuels treatment, 2012 NPS Photo.

Figure 2b. The same plot immediately after the fuels treatment, 2012 NPS photo.

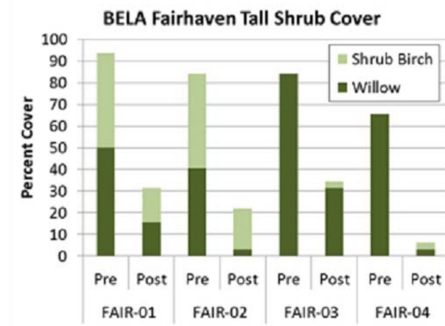


Figure 3. Percent cover of willows (Salix pulcra and S. glauca) and shrub birch (Betula glandulosa) for each transect before and after the fuels reduction project at the Fairhaven Cabins in Bering Land Bridge NP.

(80% CI)) cover after the fuels reduction project.

The management objectives were met for the fuels treatment project.

The project area was within the burn perimeter of a large 1977 fire (Kugruk Hi fire) (see Figure 1). Fire evidence was detected adjacent to the cabin sites, with evidence of a small spot fire that reached within a few feet of one of the cabins. Clearing the brush and opening the area around these historic structures will benefit future structure protection efforts in the event of a wildfire.

Finding Time Savings in Your Sampling Protocols

Scott Weyenberg, Great Lakes Ecoregion Fire Ecologist

INTRODUCTION

Over the past several years our budgets have been steadily cut, which for most of us has equated to fewer pay periods for our seasonal employees. For the Great Lakes fire effects program, this resulted in very tight sampling schedules and the elimination of some of the less important plot reads (samples). However, after reducing the number of samples, more cuts were still needed. We then started hacking away at the sampling itself. For instance, the overstory DBH and canopy sampling were put on 10 year schedules. The biggest time sink; however, is sampling the point intercept transects. This is most evident at Indiana Dunes National Lakeshore (INDU), where they have some of the highest plant diversity in the Park Service. It can often take over an hour to sample one transect on some of the more diverse sites. Reducing the number of transects or the number of intercepts per transect could result substantial time savings. The big question is, can it be done without losing the temporal continuity of the data, e.g. will the new methods and old methods be comparable? The purpose of the investigation was to determine if reducing the number transects or intercepts would result in significant changes in percent cover or diversity.

METHODS

Data from the INDU Oak Woodland monitoring type were analyzed. Standard FMH point intercept protocols were used; two 50-meter transects with 166 samples taken per transect. In addition, 10-1m frequency squares were sampled every 5-meters per transect. The presence of each species was recorded within each frequency square. Eighteen plots and 49 plot samples were used for cover and diversity analyses. However, when frequency data were compared, only 11 plot samples were available.

The analysis of data from reducing the number of transects from two to one did not proceed past the exploratory stage. Data analyses on the reduction in the number of intercepts per line were performed by creating two subsets of the original data. The subsets were created by excluding every other intercept and two out of every three intercepts (1/2 and 1/3 sets respectively).

Student's t-tests and ANOVAs were used to test for differences in percent cover and species diversity (mean number of species) between the subsets and the full dataset. Significance was set at the 0.05 level. Total percent cover and cover for each species were calculated by averaging transects 1 and 2 for each plot sample.

RESULTS

Transect reductions

After exploring the species diversity data for several plots by transect,

Time savings continued from page 9

it was quickly determined that simply eliminating one transect would not work. Percent cover between the two transects appeared to be considerably different. Several plots had noticeably different species assemblages between the transects and eliminating one would significantly change the species composition of the plot as compared to previous samples. This in turn would not allow us to compare these data to earlier samples. Therefore, this approach was abandoned.

Cover

Of the 249 species encountered, about 90% had cover values less than 4%, which varied imperceptibly among the three datasets. Of the remaining species, the maximum difference in cover between the full set and the 1/2 and 1/3 subsets was 4% and 8% respectively. On a per plot basis, the maximum difference in total cover between the full dataset and the 1/2 and 1/3 subsets was 9% and 12% respectively. There were no significant differences in individual species cover or average total cover between the datasets (p > 0.37) (Figure 1).

Diversity

The mean number of species per sample was tested among the datasets. The 1/2 and 1/3 subsets were both significantly different from the full dataset (p < 0.0001, n = 49), missing on average between 5 and 8 species per sample. Means for the full, 1/2 and 1/3 datasets were 20, 16 and 14 species respectively (Figure 1).

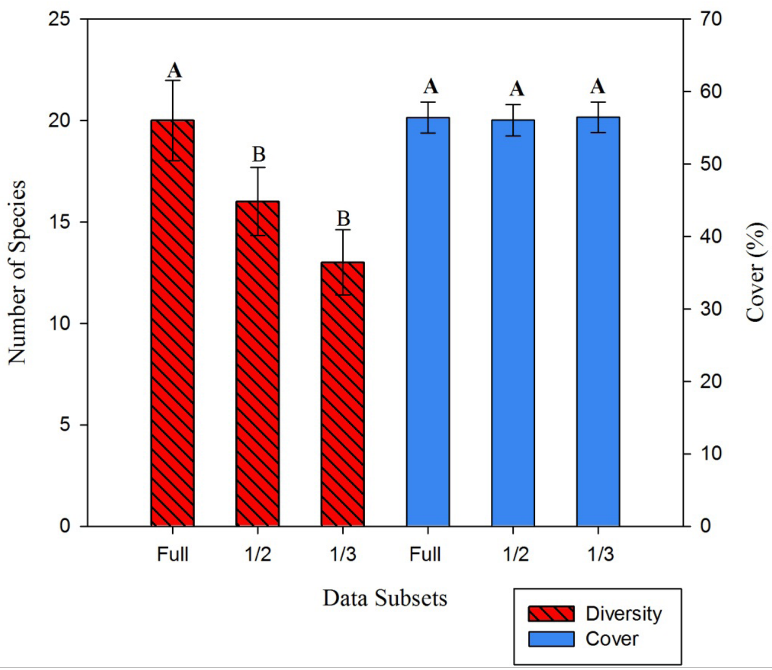


Figure 1. Average species diversity (red hashed, left axis) and percent cover (blue, right axis) for the full, 1/2 and 1/3 data sets (n = 49). Levels not having the same letter identifier are significantly different.

The diversity between the 1m frequency squares and the point intercept transects (full dataset) was found to be significantly different (p = 0.0004, n = 11). On average, 9±2 more species (30 vs. 21) were found within the frequency squares than on the point intercept transects.

DISCUSSION

Total cover among the full dataset and subsets was essentially identical, and differences in cover for individual species were minimal and not statistically or biologically significant. This result was somewhat surprising, since treatment and weather effects were not accounted for. Out of curiosity, I reduced the number of intercepts by 80%, (35 intercepts/transect) and the 90% confidence interval only increased by 2%, as compared to the full dataset. It is not clear why confidence in the estimates did not deteriorate more quickly, though, it may have to do with the large sample size.

Diversity estimates were clearly impacted by the reduced number of intercepts. This was, however, accounted for via the frequency squares. Most of the species missed by the point intercept method tend to be diminutive in nature and their percent cover is not especially meaningful. Therefore, the fact that they are missed in cover sampling does not impact the data, as long as they are found present elsewhere. I was not able to determine whether the “No Hit” search would sufficiently account for the species missed when intercepts are reduced, since this was a post-hoc analysis. Others have found that it is easy to miss species in the “No Hit” belt because of the large search area. More species tend to be found in numerous but relatively small search areas.

In the end, we reduced the number of intercepts by ~40% by taking measurements every half meter. It could have been reduced by 50% or more, however, measuring every half-meter is far simpler and consistency among the other monitoring types needed to be considered. Diversity estimates will not suffer as long frequency square sampling continues.

Scott Weyenberg
Great Lakes Ecoregion Fire Ecologist
Saint Croix National Scenic Riverway
401 N. Hamilton St.
St. Croix Falls, WI 54024
Ph: 715-483-2285
Fax:715-483-3288

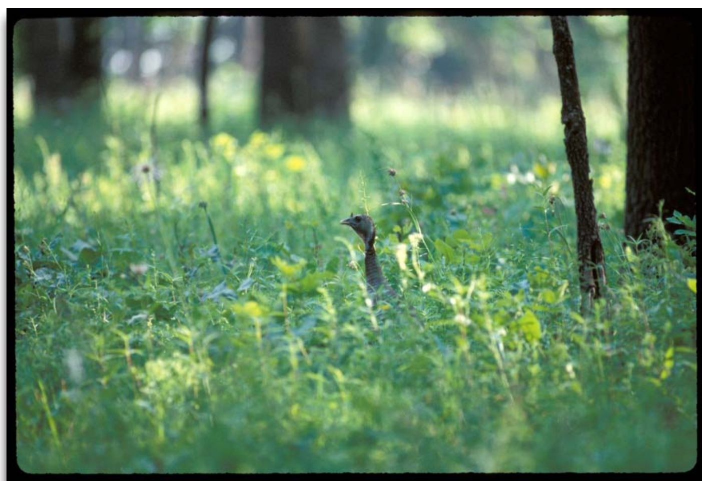
National Wild Turkey Federation Helps Restore Glades and Woodlands on Jerktail Mountain

Dan Drees, Fire Ecologist, NPS Ozark Highlands Group

A lifetime of conservation work had taken me to many remote areas in the Missouri Ozarks, but nothing as remote as Jerktail Mountain in Shannon County. I had driven 17 miles of gravel road from the closest blacktop highway and was on foot headed up Jerktail Mountain when I met two turkey hunters headed out with a dandy late-season gobbler.

The purpose of my trip was to scout Jerktail Mountain for a new prescribed burn unit that could be managed jointly by the National Park Service and Pioneer Forest. One look at the hunters' trophy told me that the potential benefits of prescribed burning for the wild turkey population, and turkey hunters, could be tremendous.

Thanks in part to a $2,500 grant from the Missouri Chapter of the National Wild Turkey Federation, development of this new 1,836-acre prescribed burn unit is rapidly moving forward. Jerktail Mountain hugs the east bank of the Current River along a big bend between the Jerktail Landing river access and the Two Rivers access, perfectly located for floating or boating into one the most remote turkey hunting gems in Missouri.



Hen with 11 hidden poults in woodland habitat. Photo courtesy Missouri Department of Conservation.

About 60% of this new burn unit is on Pioneer Forest land and about 40% is on National Park Service land, in Ozark National Scenic Riverways. All of it is open to statewide hunting regulations. Pioneer Forest is dedicated to sustainable forest management and protection of exemplary natural and cultural areas on the 142,000 acres that it owns in the Missouri Ozark region. Pioneer Forest has served as a model for over 60 years for how single tree timber-harvest selection can be a viable alternative to clear-cut harvesting.

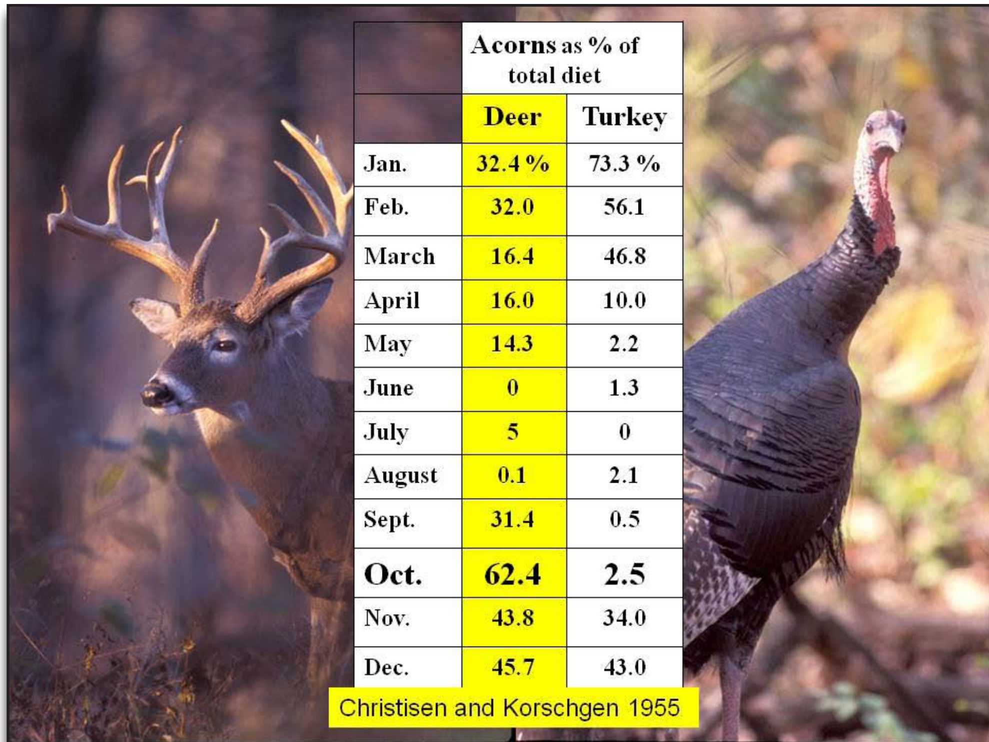
The potential to greatly enhance turkey brood rearing habitat on Jerktail Mountain is tremendous. This mountain contains an abundance of small partially-overgrown glades that are well dispersed over a large area. Glades are natural openings in the timbered landscape where the bedrock is close to the surface. Historically, periodic fire and drought prevented trees from shading out the abundance of native wildflowers and grasses that make glades very important to wildlife.

Once the Jerktail Mountain glades are opened back up with prescribed fire and cedar cutting, they will be turkey poult paradise. Prescribed fire is fire that is carefully planned and controlled to accomplish specific objectives at an individual burn unit. High quality Ozark glades typically have a combination of native sun-loving wildflowers and grasses that can consist of several hundred species. These wildflowers and grasses will then attract several thousand species of insects that pollinate the flowers, eat the plants and eat other insects.

Of course, it is this insect diversity and abundance that then feeds turkey poults and many other bird species that specialize in finding food at ground level. It is not an exaggeration to say that what is good for turkey poults is good for many bird species that are declining nationally.

In addition to finding insects, turkey poults also have to avoid numerous predators. Again, Jerktail Mountain is well poised to fulfill this requirement because it has many glades spread over a very large area. Predators find it hard to predict where a hen will be if she has many options on where to find insects for her poults. Furthermore, these glades are connected to each other by timbered habitat called woodlands.

Although both woodlands and forests can look similar, and both contain significant numbers of trees, there are some key differences that matter greatly to turkeys. In Ozark forests, most of the insect production occurs above ground level where turkey poults cannot reach the insects. In Ozark woodlands much of the insect production occurs at ground level, and insect availability is more spread out throughout the brood rearing season.



	Acorns as % of total diet	
	Deer	Turkey
Jan.	32.4 %	73.3 %
Feb.	32.0	56.1
March	16.4	46.8
April	16.0	10.0
May	14.3	2.2
June	0	1.3
July	5	0
August	0.1	2.1
Sept.	31.4	0.5
Oct.	**62.4**	**2.5**
Nov.	43.8	34.0
Dec.	45.7	43.0

Christisen and Korschgen 1955

Table 1. Courtesy of the Missouri Department of Conservation.

NWTF continued from page 11

This increased availability of woodland insects at ground level occurs because healthy fire-managed woodlands have a dense and diverse layer of wildflowers and grasses beneath mature fire-tolerant oaks and pine. For turkeys and many other birds, these glade and woodland complexes provide the perfect balance of nesting cover, bugging areas, and acorns. Despite the abundance of acorns in October, the renowned and still relevant research of Christisen and Korschgen, 1955, showed that turkey and deer utilize acorns differently (see Table 1).

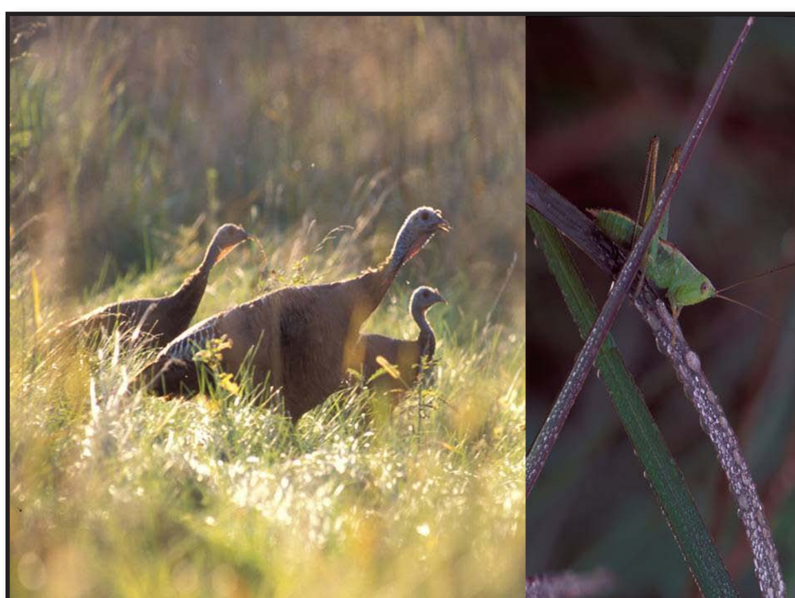
In the Missouri Ozarks, while acorns comprised 62% of a deer's October diet, acorns only comprised 2.5% of a turkey's October diet. Most October turkey hunters know, as long as grasshoppers and other insects are still available in glades, woodlands, and similar habitats, that is where the turkeys are feeding.

Thanks to their ability to find hidden acorns by scratching through the leaf litter, acorns do not become the mainstay of a turkey's diet until January. Consequently, any turkey biologist will tell you that having more insects throughout the growing season at ground-level is the key to maximizing the turkey population potential of an area.

Unpublished research in the Missouri Ozarks by Jon Hallemeier and Alan Templeton found grasshoppers were 650% more abundant in prescribed burn units than adjoining unburned areas. In addition to growing more turkeys, the potential increase in ground level insects at Jerktail Mountain will also benefit Prairie warblers. Ironically, Prairie warblers are far more common in Missouri's glades than in Missouri's prairies. Prairie warblers have declined nationwide by over 65% since 1966. Data from the Ozarks shows Prairie warblers were 27 times more abundant in managed habitat than unmanaged habitat (Thompson et al, 2010).

Commercial timber harvest is another important tool for restoring glades and woodlands to their normal tree densities, and full potential for biodiversity. Pioneer Forest is conducting dormant season thinning of the overcrowded trees from their portion of Jerktail Mountain. Their foresters have put an emphasis on harvesting eastern red cedar and other species that have become unnaturally abundant in the decades without fire.

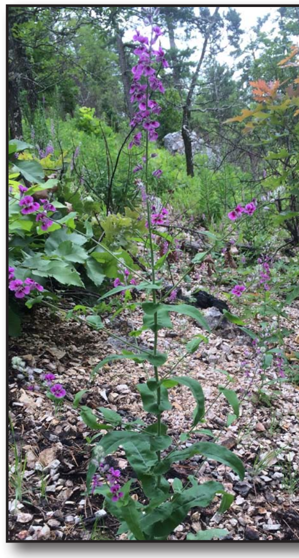
Growing good quality timber on the same acres where a landowner wants to grow more ground level native wildflowers and grasses for insects requires careful planning and implementation. Fire practitioners and foresters need to implement their expertise diligently and patiently, but over time the results can be beautiful, benefit species currently in decline, and result in some exceptional turkey hunting experiences.



Spring Burn Promotes Germination of Ouachita Twistflower

By Virginia McDaniel, Southern Research Station

In early June I accompanied Arkansas Natural Heritage Commission (ANHC) Botanist Brent Baker on several trips in the Ouachita National Forest in search of Ouachita twistflower (*Streptanthus squamiformis*), a member of the mustard family. Ouachita twistflower is an annual species endemic to the Ouachita Mountains of Arkansas. It is named, scientifically, for the prominent pubescence of squamous (covered in scales) hairs found on its sepals, pedicels, and often fruits; a diagnostic character that distinguishes it from other twistflowers found in the Ouachita Mountains. It is found on southeast, south, and southwest facing, steep, rocky slopes and ravines in open woodlands.



This year was an all-around bad year for Ouachita twistflower. Brent was coming up empty handed in locations he had seen it in previous years. Even in a good year Ouachita twistflower is found sporadically with an individual here and another there, but populations this year were unusually small. The long, cold winter had set flowering behind, but the individuals he was finding this week were past their flowering prime. Without flowers, it is difficult to spot the scattered twistflower.

We decided to get some insight from National Forest District personnel and stopped by the Mena Ranger District Office. The District Fire Management Officer, Adam Strothers, mentioned they had conducted a prescribed burn this spring (March 26) on Fodderstack Mountain, which was prime Ouachita twistflower habitat. Rhonda Watson, District Wildlife Biologist, verified there was a known population from there. Adam mentioned that burning to the south of Mena is tricky because the terrain is steep, the rocky slopes have very little duff to protect tree roots, and it is very easy to burn it too hot. This knowledge led Adam to ignite the burn by hand and to just light the top of the mountain and let the fire back gradually down the mountain. I, unfortunately, had to get back to Hot Springs and left the mystery to Brent.

Anxious to see the effects of a spring burn on Ouachita twistflower, Brent set out for Fodderstack Mountain with doubts, thinking the spring burn may have killed germinating seedlings. However, as he climbed the mountain he began to see the beautiful pinkish purple of Ouachita twistflower. As he climbed higher, the numbers increased and the plants got bigger. Hundreds of individuals were scattered across the mountain side! It seems the backing fire created just the right conditions to key the seeds to germinate. The plants on Fodderstack were about three weeks behind the blooming of other populations Brent observed this year, but he found more plants in this area than he had seen in any area this year. Hurrah for Rx-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, the Fire Monitoring Handbook , FEAT/FIREMON Integrated (FFI), 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 ecology community know about you and your program.

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/wildland-fire/what-we-do/science-ecology-and-research/rx-effects-newsletter.cfm

Thanks to Diane Abendroth, Jennifer Barnes, Dan Drees, Virginia McDaniel, Dan Swanson, and Scott Weyenberg, for submitting articles for this issue. Submissions not included in this issue will be saved for future editions.

****New Editor Wanted****
2- year commitment (2 issues)
If interested, please submit your name by Nov. 30, 2014 to:

Marybeth Keifer
(603)-795-2333
marybeth_keifer@nps.gov