Rx Effects

National Park Service
U.S. Department of the Interior

Fire Effects Monitoring Program

Burn Severity Thresholding Using ZunZun and the CBI Thresholding Tool

Josh Picotte[1], GIS Fire Analyst
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We have developed a process that utilizes the ZunZun curve fitting program and the CBI Thresholding Tool to more easily threshold remotely sensed burn severity imagery, including Normalized Burn Ratio (NBR), differenced Normalized Burn Ration (dNBR), and Relative differenced Normalized Burn Ratio (RdNBR), with ground collected Composite Burn Index (CBI) data. When used in concert the two programs produce an output graph (Fig. 1) that illustrates the low, moderate, and high burn severity thresholds and a text file (Fig. 2) that contains the burn severity thresholds and the curve equation utilized in the curve fitting process. These quickly generated outputs can then be inserted into documents and presentations.

ZunZun (http://www.zunzun.com) is a free web-based curve fitting program that allows the user upload data and either manually choose from amongst 100's of curve equations or have the program determine the best fit curve equation. Once the user has determined the most appropriate curve equation, users can then create downloadable graphs, determine the curve's parameters, determine the how well the curve fits the data, and download all of the statistical reports in a single PDF file. All of ZunZun's graphical and statistical processes are similar or superior to those found in Sigmaplot®, Microsoft Excel®, or similar fee-based products.

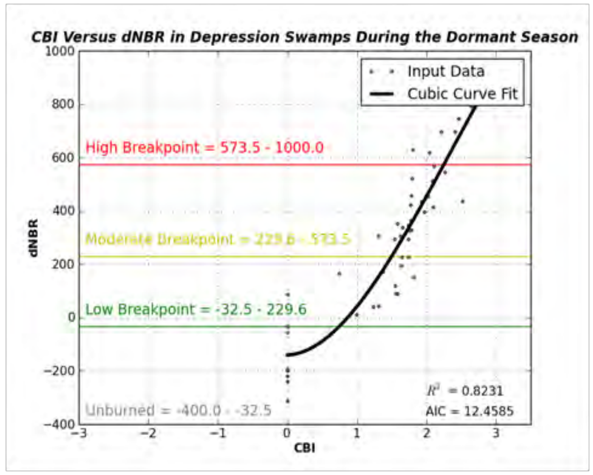

Figure 1: Cubic curve fit of dNBR with CBI data and subsequent calculation of low, moderate, and high burn severity breakpoints generated by using the CBI Thresholding Tool. R^2 and AIC values indicate the curve's goodness of fit with the data.

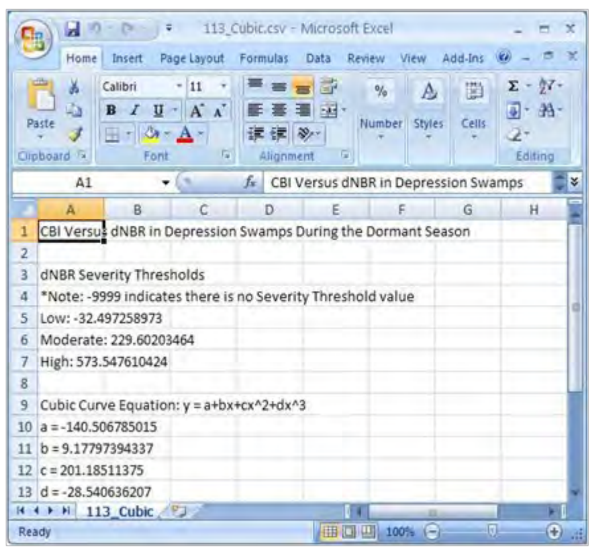

Figure 2: Example text output of the CBI Thresholding Tool.

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Fire Ecology on the Rim, Grand Canyon National Park

Jasper and Jenn Peach

During the spring of 2010, Jasper Peach, Grand Canyon National Park (GCNP) Assistant Fire Effects Lead, and Jenn Peach, volunteer for GCNP Environmental Education, collaborated on researching fire education programs and developing a Grand Canyon-specific fire ecology curriculum. The end product is a curriculum designed for use by GCNP educators and educators outside the park interested in incorporating fire ecology into their science curriculum. The program is geared toward middle and high school students and incorporates classroom learning, lab demonstrations and experiments, and field experience meeting the Arizona State Standards. Fire Effects tools, protocols, and methods are incorporated into the curriculum. The activities and field experience are modeled after skills used by the GCNP Fire Effects Crew with the thought that data collected could potentially be incorporated in the GCNP Fire Monitoring Program.

One of the main goals of the program is to give students a chance to conduct research like a professional – submersing them into a potential career pathway. Another main objective is to get local students at the local high school and middle school within GCNP to become familiar with and gain an understanding of fire ecology. This is hugely important at GCNP because fire, both planned and unplanned, is an integral part of GCNP's management plan and can affect the daily lives of the Grand Canyon community. The field experience component of this program will be carried out primarily around Grand Canyon Village where local students live and visitors (and visiting students) recreate. Small prescribed fires and mechanical thinning treatments scheduled in the Village for the coming years should provide students with opportunities to compare data across years and treatment types.

The curriculum includes detailed instructions so that the program can be accessible to students and educators of all levels and science familiarity. Background information and activities are included to help educators unfamiliar with fire to present the material in an accurate and exciting way. The program is flexible enough to be used as a weeklong teaching unit or condensed as a two-day field trip. After completing field testing with Grand Canyon Educators, the Peaches will make the curriculum available for use in the 2010-2011 school years.

Funding was gained through an in-park small grant and from the Intermountain Region. This program was collaboration among the Grand Canyon Environmental Education staff and volunteers and Grand Canyon Fire Ecology Program. If you have any questions or would like to receive a copy of the program please contact Jasper Peach at jasper_peach@nps.gov.

Strategies for efficient early detection of invasive plants after prescribed fire

Dan Swanson

Last winter the Fire Ecology Steering Committee awarded research reserve funds for a three-year invasive plant species research project in three Black Hills parks of South Dakota and Wyoming. Table 1 shows a list of twenty target species that was developed by park resource managers who are concerned that prescribed burns provide opportunities for new invasions by plant species not previously present in a park, or for new infestations of invasive plant species the park is already managing. To address these concerns, we will address the following questions: 1.) Does prescribed fire promote target invasive plant species in Black Hills ponderosa pine forest? 2.) What is the most efficient way to search for invasive plants affected by prescribed fire in this ecosystem? We will answer these questions by using field data and GIS to determine the relationship between target invasive species and a variety of pre- and post-fire environmental characteristics. This relationship will provide the information to develop a predictive model for the occurrence of these target species following prescribed fire, which we will use to describe a prioritized strategy for future post-fire invasive species monitoring.

Table 1. Target invasive species sampled in each park.

Species	Common Name
Acroptilon repens (previously *Centaurea repens*)	Russian knapweed
Bromus arvensis/tectorum	field brome/cheat grass
Carduus nutans	musk thistle
Centaurea stoebe ssp. micranthos (previously *C. biebersteinii*)	spotted knapweed
Cirsium arvense	Canada thistle
Cirsium vulgare	bull thistle
Cynoglossum officinale	houndstongue
Euphorbia esula	leafy spurge
Hyoscyamus niger	black henbane
Hypericum perforatum	common St. Johnswort
Leucanthemum vulgare	oxeye daisy
Linaria dalmatica	Dalmatian toadflax
Linaria vulgare	yellow toadflax
Melilotus officinale	yellow sweetclover
Marrubium vulgare	white horehound
Onopordum acanthium	Scotch thistle
Potentilla recta	sulfur cinquefoil
Salsola collina/tragus	(slender) Russian thistle
Tanacetum vulgare	common tansy
Verbascum thapsus	common mullein

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*(**Strategies for efficient early detection of invasive plants after prescribed fire continued** from page 3)*

This research is being done at Wind Cave National Park (WICA), Jewel Cave National Monument (JECA), and Devils Tower National Monument (DETO). All three have active prescribed fire and exotic plant management programs. Together, these parks have 5 prescribed burn units, containing at least 80 acres of ponderosa pine forest each, scheduled to be burned in a time frame appropriate for this research (fall 2010/spring 2011 and fall 2011/spring 2012).

This summer, pre-burn data was collected in 115, 10-m radius plots in prescribed burn units scheduled to be burned before the next growing season. Plots were allocated among the burn units in proportion to the size of the burn units and distributed using a stratified random design, in which locations are stratified on as many variables in the model (see table 2 below) as possible. A small subset (~5/burn unit) of these plots will be designated for fire exclusion and will not be burned. In the second and third year, all plots will be revisited and similar data collected.

Table 2. Strata used for establishing sample locations at Devils Tower N.M. Each stratum will contain 1-6 unburned plots.

Park	Burn Unit	*Vegetation Class*	Aspect	Soil	Proximity to Road
DETO	Belle Fourche	*Pinus ponderosa/Quercus macrocarpa* woodland	SW	loam	>50 m from paved road
DETO	Belle Fourche	*Pinus ponderosa* woodland or closed-canopy forest	NE	clay	>50 m from paved road
DETO	Belle Fourche	*Pinus ponderosa* woodland or closed-canopy forest	SW	clay	>50 m from paved road
DETO	Belle Fourche	*Pinus ponderosa* woodland or closed-canopy forest	NE	loam	>50 m from paved road
DETO	Belle Fourche	*Pinus ponderosa* woodland or closed-canopy forest	SW	loam	>50 m from paved road
DETO	Belle Fourche	*Pinus ponderosa* woodland or closed-canopy forest	NE, SW	clay or loam	≤50 m from paved road

Two types of field data were collected in all plots. The first type focused on environmental factors we expect to impact the occurrence of the target invasive species following a prescribed fire (i.e. slope aspect, slope grade, slope position, forest structure, tree canopy cover, pre- and post-fire dead and down woody fuel load, herb-layer life-form cover, and fire severity). The second type of data focused on the twenty target invasive species. Frequency and cover of these target invasive species were recorded in each plot using 24 1-m^2 subplots arranged in a regular pattern within the plot. In each subplot, cover was estimated visually and recorded as modified Daubenmire cover classes.

Data analysis has yet to be performed for the 2010 pre-burn data since the field season just ended. Preliminary assessment of the data indicates eight of the twenty target species were found this season within the three parks combined.

Fire Ecology Weighs in on Natural Resource Condition Assessments

By Sherry Leis, Fire Ecologist--HTLN

Natural Resource Condition Assessments (NRCA; formerly known as watershed condition assessments) are ongoing in the Midwest as well as across the country. The program was funded by WASO starting in 2006 to be completed by 2014. These assessments are an effort to work with parks to bring together data from multiple sources for a holistic assessment of ecological condition of individual resources and the status of the park as a whole. Not only can the process highlight critical knowledge gaps, and emerging threats and stressors, but the results can easily be applied to planning efforts requiring natural resources data.

The Heartland Inventory and Monitoring Network (HTLN) has taken the lead on NRCAs for WICR, PERI, and GWCA with other Network parks to follow in the coming years. As part of the process, parks and network staff identified critical resources, their indicators, and associated quantifiable management targets. Targets were derived from monitoring data, published scientific data, and/or professional judgment. These targets will be used to identify the condition or status of each indicator and the park as a whole. The targets for some indicators may already be defined in existing plans such as: fire management plans, prescribed burn plans, or even vegetation management plans.

Fire Ecology staff from the Ozark National Scenic Riverways (ONSR) and HTLN joined HTLN ecologists, park staff, and cooperators for a workshop to revise indicators and associated management targets as well as spatial delineation of current and historic communities. The specialized knowledge of fire ecologists as well as the critical data they collect are important components of these assessments for parks in the region. Fire ecologists are often well versed in the use of fire to restore historical community types at national parks. Examples of indicators relevant to NRCA represented in fire effects data are: fuel load status and thresholds, overstory tree density, and herbaceous plant species richness. In some parks across the US, both Inventory & Monitoring and Fire Effects teams collect data related to status and trends of terrestrial natural resources. Although these datasets may have both complementary and redundant components, they both contribute important data to an effort like this. A more complete and powerful analysis can be derived by including data from monitoring efforts.

Director's Orders and Reference Manual (RM) 18 suggest that Fire Effects teams work together with Inventory & Monitoring. NRCA projects are an example of the wisdom in that directive. Involving fire effects and operations staff at the workshop was critical to getting a consistent message about park's needs and visions for the future to all involved. Participation at the workshop also facilitated better communication related to prescribed fire planning and a more accurate NRCA product.

(Burn Severity Thresholding Using ZunZun and the CBI Thresholding Tool continued from page 1)

The CBI Thresholding Tool (Fig. 3) created by Josh Picotte allows the user to choose from four of the most commonly used curve fitting methods including linear, cubic, Menten, and Sigmoid. Once the appropriate parameters have been entered, the user can then select the "Run Model" button to produce and output graph and text file (Figs. 1 and 2). The burn severity breakpoints that generated in these outputs can then be used to classify remotely sensed burn severity imagery into unburned, low, moderate, and high burn severity classifications.

If you would like more information about ZunZun or the CBI Thresholding tool, please e-mail Josh Picotte (jpicotte@ttrs.org). The CBI Thresholding Tool and a PowerPoint presentation with the accompanying script that describes the entire thresholding process are available upon request. Although at this time there are only four different curve fitting methods available for the CBI Thresholding tool, additional ones

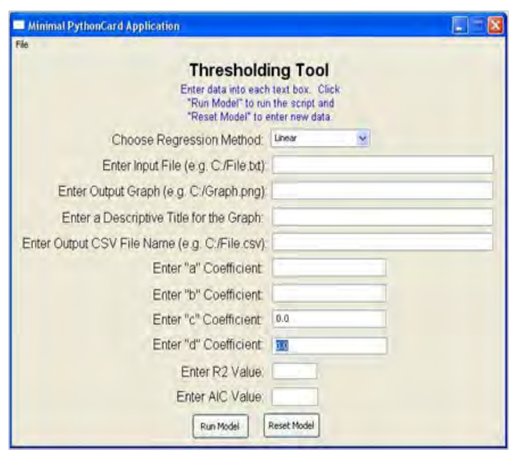

Figure 3: CBI Thresholding Tool's interface (GUI) for entering in graphical and statistical parameters determined by ZunZun.

Josh Picotte is currently working for NPS SER supporting SER burn severity mapping efforts.

FFI – Keeping Pace with Technology….

MaryBeth Keifer

Ecological Monitoring Utilities

Visit the FFI Website hosted on FRAMES: frames.nbii.gov/ffi

In June we released the current version of FFI (v1.04). The primary new feature of v1.04 is sample event import and export - functionality designed for those using (or planning to use) field computers to collect data. If you chose not to update this time around, you will be able to update directly from v1.03 to v1.05. Many users are still enjoying the latest user-requested features like moving, hiding, or freezing columns for easier data entry and adding multiple macro plots.

The next version of FFI is scheduled to be released this fall. Users won't see a lot of new functionality in FFI v1.05 as we work to maintain compatibility with the ever-changing technology realm. FFI v1.05 will incorporate a number of changes to ensure compatibility with new operating systems and software applications used by NPS, as well as provide some relatively complex database changes to improve performance. Major focus areas are:

- Make FFI faster through changes to the database key (data loading, user input processing)
- Resolve Query Builder data loading speed and save-time issues that affect some large databases
- Update FFI to work with Windows 7 and SQL Express 2008
- Update the GIS toolbar to make it ArcGIS10 compatible
- Find a better way to manage user roles and permissions
- Improve import/export functionality.

FFI (FEAT/FIREMON Integrated) is now so well integrated that no one even remembers what FEAT was and the only people still using FIREMON are wondering why? The seamless nature of this application is so striking, that that the acronym has dissolved into a single sound ("phhhhhhiiii"), so we're changing the name to Φ (!).

The Google Group Discussion Site (http://groups.google.com/group/ffiemu) continues to be an active forum for the FFI user community. Many questions are answered and tips posted by a variety of users. Keep the suggestions, questions, and helpful hints coming!

Training announcements, software, user guides, training materials and more are available on the FFI FRAMES Web site (http://frames.nbii.gov/ffi).

An FFI training workshop is scheduled for October 13-15, 2010 in Albuquerque, NM for BIA/FWS employees (a few limited spaces may be available to others) and the next open FFI workshop is scheduled for January 11-13, 2011 in Boise, ID.

Please contact MaryBeth Keifer (marybeth_keifer@nps.gov or 603-795-2333) for any questions or additional information.

An Oak Forest Overstory Assessment Base on Growth Form Characteristics

Scott Weyenberg & Mary Fisher-Dunham

Introduction

Indiana Dunes National Lakeshore is interested in restoring certain areas to oak savanna. Since the advent of widespread fire suppression in the early 1900's, many of these savannas became overgrown and now resemble forests rather than savannas. To restore this savanna condition we needed to know what trees to leave and how many. Specifically we wanted to determine a target tree density (basal area), and from this, determine a target canopy cover. These targets could be determined from the remnant trees still found on the site. Additionally, data from these trees were compared to suggested densities for oak savannas to determine if in fact the site could have been a savanna to begin with.

Methods

To quantify the remnant trees they needed to be sampled separately from the younger cohorts. This could not be done simply by diameter size class separation, due to size overlap among cohorts. A sampling scheme was developed where the trees were separated into cohorts during field sampling based on visual characteristics.

The oldest cohort was identifiable based on their open-grown nature, deeply furrowed bark, upper canopy position and a general craggy look (Figure 1). The second cohort was identified as not open-grown, smoother bark, dominant to co-dominant canopy position and a uniform look. The third and youngest cohort consisted of relatively small trees growing in the intermediate or lower crown positions. There were only a few trees sampled that were difficult to categorize properly.

Field sampling was simple and done in the winter. It consisted of installing 26 variable radius plots (10 BAF prism) placed along four transects. Within each plot the species, diameter, cohort and live/dead status of each tree was recorded.

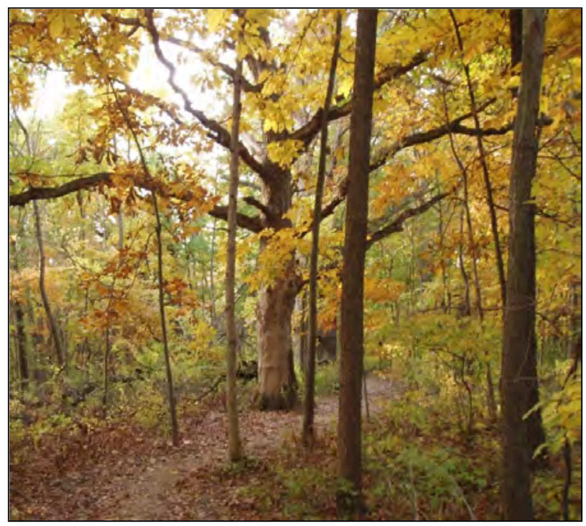

Figure 1. An example of an open-grown remnant tree.

Results

The analysis consisted of separating the trees by cohort and assigning a rough size class to each. Table 1 shows the basal area breakdown by cohort, with ***1*** being the oldest cohort. The basal area for the oldest cohort was converted to canopy cover using the relationship between basal area and canopy cover of open grown oaks determined by Law et al. (1994).

The canopy cover across the entire site, considering all age classes, is 100%; more if you count overlap. Based on an estimate of 7.5 trees per acre (back-calculated from the data) and an average diameter of 22 inches, the oldest cohort contributes ~25% to the total cover (data not shown). This fits squarely within the canopy cover estimate for an oak savanna, which is 15% to ~50%. Similarly, Taft (1997) recommends 13 – 35 ft^2/ac as an appropriate range of basal area for an oak savanna, of which the oldest cohort falls directly in the middle, at 20 ft^2/ac (Table 1).

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(AN OAK FOREST OVERSTORY ASSESSMENT BASED ON GROWTH FORM CHARACTERISTICS CONTINUED *from page 7*)

Table 1. Average overstory basal area (ft²/ac.) per age class and species.

	Cohort			
Species	**1**	**2**	**3**	**To-tal**
Red/Black Oak*	17.7	44.2	2.3	64.2
White Oak	1.5	1.1	1.1	3.7
Red Maple	—	0.4	—	0.4
Basswood	0.8	—	—	0.8
Sassafras	—	—	2.3	2.3
Black Cherry	—	—	0.4	0.4
Totals	**20**	45.7	6.1	71.8

*Red oak data were combined with black oak given the limited number of red oaks and the difficulty in identification between the two during leaf-off conditions. Age Classes: 1 - Old (16"+), 2 - Mid (6 - 16"), 3 - Young (2 - 6")

CONCLUSION

The remnant overstory of large open-grown black and white oaks gives us some indication of what this site was like 75 to 100 years ago. The density and canopy cover derived from these trees is a minimum threshold to work from, as many remnant trees are likely missing. Whether it is due to fire or grazing, the site was far more open in the past, resembling a savanna rather than a forest, which is there today. This analysis will give park managers a target density if they proceed with restoration of this site or others nearby. This method can be used at other areas having remnant trees and may be combined with mapping to determine the former spatial distribution of trees within a prairie-savanna mosaic.

REFERENCES

Law, J. R., P. S. Johnson, and G. Houf. 1994. A crown cover chart for oak savannas. TB-NC-2, USDA Forest Service, North Central Research Station, St. Paul, MN.

Taft, J. B. 1997. Savannas and woodland communities.*in* M. W. Schwartz, editor. Conservation in highly fragmented landscapes. Chapman and Hall, Chicago, IL.

Upcoming Conferences

Natural Areas Conference – October 25-29, 2010—Lake of the Ozarks, MO

3rd Fire Behavior and Fuels Conference – October 25-29, 2010—Spokane, WA

Prescribed Fire Workshop for Resource Specialists—November 14-19, 2010—Tallahassee, Florida

George Melendez Wright Society Conference – March 14-18, 2011—New Orleans, LA

4th Fire in Eastern Oak Forests Conference —May 17-19, 2011—Springfield, Missouri

Black Hills Thinning and Chipping: Initial Results

Kate Cueno, graduate student, Colorado State University
Monique Rocca, assistant professor, Colorado State University
Cody Wienk, Midwest Region Fire Ecologist

This research is a collaboration between Northern Great Plains Fire Management and Colorado State University. It is funded by the National Park Service through the Cooperative Ecosystem Study Unit.

Purpose of Study

Restoration and fuels reduction of ponderosa pine in the southern Black Hills presents a management challenge. Fire suppression and rapid natural regeneration have created overgrown forests dominated by small-diameter trees. These forests are at increased risk of catastrophic wildfire. Safe application of prescribed fire also becomes difficult in these overgrown forests. Traditional hazard fuels reduction involves mechanical thinning of stands, piling the thinned material, and burning piles with snow cover. Snowfall of the depth required to conduct pile burns does not occur reliably in the southern Black Hills. Distributing wood chips from mechanically thinned fuels, "thinning and chipping," provides an alternative to traditional thin and pile burning.

The ecological effects of distributed wood chips on forest ecology remain unknown. The goal of this study is to examine the effects of thinning and chipping. Specifically, we will examine the effects of distributed wood chips on forest understory plant communities and soils at Mount Rushmore National Monument and Wind Cave National Park. Treatments include: 1) mechanical thinning, 2) thinning and chipping, and 2) control, no treatment. Mechanically thinned fuels will be removed from plots in the first treatment. Wood chips will be distributed on the forest floor in the second treatment.

Research questions we hope to answer include: a) Do distributed wood chips suppress or enhance the understory plant community? b) Do wood chips favor certain plant strategies over others, e.g. seed size or dispersal, moisture requirements, N-fixation, or life form? c) Does thinning and chipping promote or reduce exotic species? d) Do wood chips alter nitrogen availability in the soil? We hope this research will provide fire and resource managers in the Black Hills with the information necessary to determine if thinning and chipping is a viable fuels management alternative in the ponderosa pine ecosystems they manage.


Figure 1. Tracked chipper equipment in action at Wind Cave.

Timeline

- Summer 2008. Pre-treatment data collection.
- Summer 2009. Project implementation and immediate post-treatment data collection.
- Summer 2010. Post-treatment data collection.
- Fall 2010 – Winter 2011. Thesis / manuscript preparation and results dissemination.

Research plots and treatment units were established in 2008. Study areas were roughly 120 and 60 acres in size at Mt. Rushmore and Wind Cave, respectively.

Treatment was successfully implemented April – July, 2009. All ponderosa pine trees ≤ 15cm/5.9in were hand-thinned in treatment units. Thinned trees in thin and chip units were chipped with a remotely-operated, tracked chipper.

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(Black Hills Thinning and Chipping, Initial Results continued from page 9)

Preliminary results

Data collected immediately following thinning and chipping provided a snapshot of the impacts of treatment implementation. Results of particular interest included wood chip depths/distribution and ground disturbance caused by chipping machinery.

	Depth (cm)	
	MORU	MORU
Wood chips	3.6 - 5.2	1.9 - 2.7
Total litter	4.2 - 5.9	3.7 - 4.8
Duff	1.8 – 3.0	2.2 - 3.5

Table 1. 90% confidence intervals for average wood chip, litter, and duff depths at each location.

Wood chip depth is of ecological interest, because deeper wood chip depths retain more soil moisture and may reduce vegetative cover (Binkley et al. 2003, Homyak et al. 2008, Wolk and Rocca 2009). Wood chip, litter, and duff depths were collected from 24 sample points per plot at 18 thin and chip treatment plots across both locations. Average wood chip depth measured 4.4 cm (1.7 in) at Mount Rushmore and 2.3 cm (1.5 in) at Wind Cave (Fig. 2, Table 1).

A greater range of wood chip depths were sampled at Mount Rushmore than at Wind Cave. Plot average wood chip depth ranged from 2-8 cm (0.8-3.2 in) at Mount Rushmore (Figure 3) and from 2-3 cm (0.8-1.2 in) at Wind Cave (Figure 4). Individual sampling depths were measured up to 16.5 cm at Mt. Rushmore and 10cm at Wind Cave (data not shown).

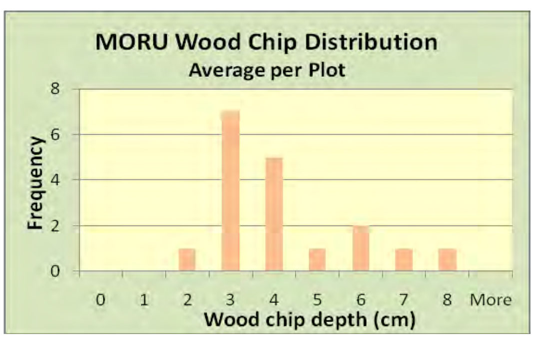

Figure 3. Distribution of plot average wood chip depths at MORU

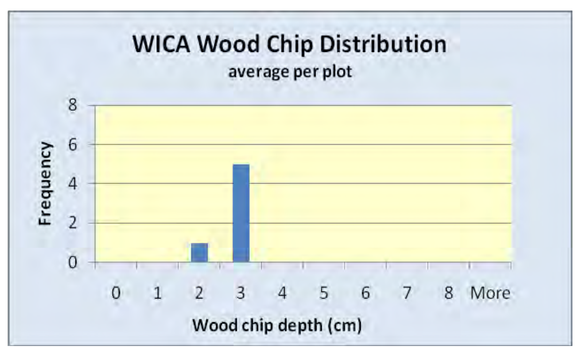

Figure 4. Distribution of plot average woodchip depths at WICA.

At both locations, no relationship was found between the number of trees thinned and the resulting average chip depth on plots (Figure 5). This lack of relationship indicates that the equipment operator had the ability to control wood chip distribution and form a relatively even layer of wood chips at broad scales. Differences in wood chip depth and distribution between project locations, but no difference in the number of trees thinned (90% confidence data not shown), provides additional evidence for control over wood chip distribution.

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(Black Hills Thinning and Chipping, Initial Results continued from page 10)

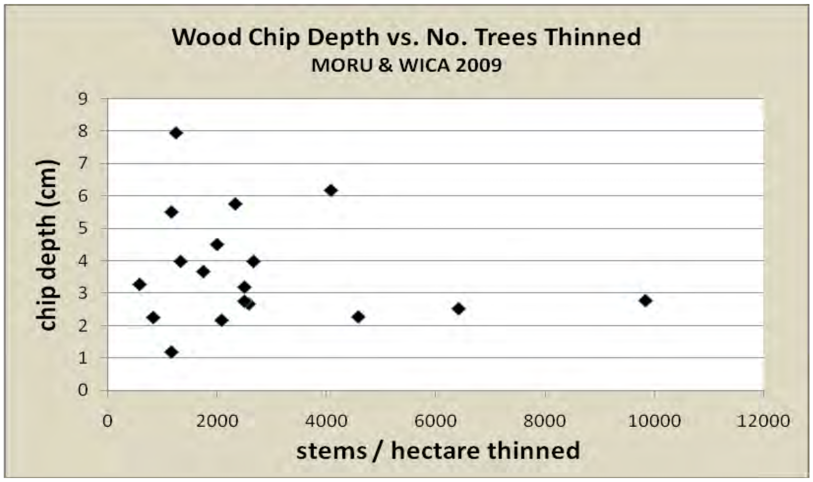

Figure 5. Average wood chip depth vs. stems/hectare of trees thinned by plot. MORU and WICA data combined. 1000 ha = 2471 ac.

Cover of bare ground and chipper (equipment) tracks were estimated as proxies for ground disturbance. Because bare ground cover was very low prior to treatment, it was assumed that any increase in bare ground would be due to disturbance from thinning or chipping activities. There was no difference between pre- and post- treatment cover of bare ground for all thin and chip plots, paired t-test $p = 0.0804$. Average cover of bare ground both pre- and post- treatment was ≤ 2% for all plots. Visual estimation of chipper tracks was used to approximate ground cover potentially disturbed by machinery. Average plot cover of sampled chipper tracks ranged from 0 – 19% at Mount Rushmore and 0 – 9% at Wind Cave (Figure 6).

Although chipper tracks were detectable, they rarely resulted in bare ground exposure. Thus, our results do not provide evidence for significant ground disturbance as a result of thinning and chipping activities. The possibility exists that wood chip cover obscured an increase in bare ground, but was not be detected with our sampling method. Additional methods, such as measures of ground compaction would provide a more comprehensive indication of ground disturbance by machinery.

Stay Tuned

Post treatment data collection was conducted in 2010. Pre and post data will be compared to determine short term changes in forest ecology following wood chip distribution on the forest floor. Overstory trees (> 15cm/ 5.9in) and pole trees (≤ 15cm/ 5.9in, taller than 1.37m/4.5ft) were sampled to determine change in forest structure. The understory plant community was surveyed to assess the effects of wood chips on understory plant composition and cover. Finally, soil nitrogen availability was sampled to further understand the mechanisms driving post-treatment responses. Study results will be available in 2011.

Literature Cited

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Wolk, B. and M. E. Rocca. 2009. Thinning and chipping small-diameter ponderosa pine changes understory plant communities on the Colorado Front Range. Forest Ecology and Management **257**:85-95.

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: Sherry Leis
A cloud was forming on top of the smoke column during the April 8th burn at TAPR.

RxFx Subscription and Submission Information

Rx Effects is the newsletter of the Fire Effects Monitoring 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, event schedules anaccepted 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 summer. The **deadline for submissions** is the last Friday in August. If you would like a subscription or more information please see our website **www.nps.gov/fire/fire/fir_eco_rxeffects.cfm** or contact:

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Thanks to all who submitted articles for this issue, including Sherry Leis, Scott Weyenberg, Mary Fisher-Dunham, Kate Cueno, Cody Wienk, Jasper and Jen Peach, Dan Swanson, Josh Picotte, MaryBeth Keifer and Caroline Noble for their submissions. Submissions not included in this issue will be saved for future editions.