



**National Park Service
Southern Utah Group
Fire Ecology Annual Report
Calendar Year 2008**

Summary

The 2008 Zion Fire Effects team enjoyed a productive year, drawing on the strong skills of new and transitioning members. Although the scheduled plot revisits were moderate in number, the crew remained quite busy because our fire program undertook multiple prescribed burns between May and October. The Fire Effects crew diligently completed the additional immediate post-fire plot reads and assisted in the prescribed fire operations. This additional work led to a total of 26 plots completed at Bryce National Park and 32 plots completed at Zion National Park for the year. The crew also spent several days sampling vegetation data for a study which is examining the effects of fire on small mammal populations.

Several Northern Arizona University Graduate students (and assistants) continued their cooperative project with Zion, collecting additional data within two recent wildfires funded through two BAER plans, Kolob Wildfire 2006 and Dakota Hills Wildfire 2007. Their research is analyzing the effectiveness of several treatment combinations in hopes of finding effective ways to minimize the colonization of invasive non-native plants such as cheatgrass. The preliminary results presented to Zion this spring show some treatments had a significant effect, at least in the short term. Our monitoring program provided NAU with logistical assistance and joined one of their crews for a long day of data collection in the late spring. Final theses from the studies are projected to be complete between Fall 2009 and 2011.

This was the first year Zion used the new database software, FFI. All existing data was exported from the older software programs into FFI and the new (2008) plot data was entered manually into the system. All data was analyzed using FFI and Excel. The team looks forward to further refinements and error corrections in the program in future versions of the program.

Table 1. Fire Effects Plot Workload 2008

Park	Monitoring Unit	Type of Plot (FMH, photo point, other)	Pre-burn	Immed. Post	Postburn (1-20 yrs)	Total Plots
Zion	Great Basin Sagebrush	FMH brush plot	2	0	5	7
	Gamble Oak	FMH brush plot	0	4	3	7
	Pinyon-Juniper	FMH forest plot	2	2	2	6
	Pinyon-Juniper	Sm. Mammal plot	30	0	0	30
	Quaking Aspen	FMH forest plot	0	0	1	1
	Ponderosa Pine	FMH forest plot	0	4	8	12
	White Fir	FMH forest plot	0	0	2	2
Bryce Canyon	Black Sagebrush	FMH brush plot	0	0	4	4
	Ponderosa Pine	FMH forest plot	0	6	6	12
	Ponderosa Pine	Photo point plot	3	0	0	3
	White Fir	FMH forest plot	0	14	0	14
Total			7	30	31	98

Fire Ecology Staffing 2008

The program benefitted in terms of both leadership and continuity by hiring the former Lead Fire Effects Monitor for the position of Fire Ecologist. Although the rest of the crew members were new to Zion, they quickly formed a cohesive team. Both the Fire Effects Lead and Assistant Lead brought considerable fire effects experience and education to this year's program, while the crew members (one Biological Science Technician and one intern) brought abilities from related fields. Additionally, Fire Effects received assistance from both local and regional resources (Helitack, Zion Engine Crew, Bryce Engine Crew, Exotic Plant Management, and Grand Canyon Fire Effects).

All members received training and experience opportunities which serve the program and build ties within the fire management & ecology communities. Crew members cumulatively concentrated on skills relating to: fire monitoring, fire ecology, GIS, leadership, helicopter support, FFI, fire behavior calculations, and wildland/ urban interface operations. The Fire Ecologist and Lead Fire Effects attended the 3rd International Congress on Fire Ecology and Management in Jackson, Wyoming. While attending, the Lead also presented work from his recent thesis which improving predictive habitat maps using burn data. It was a great opportunity to broaden their understanding of the current science and connect with others in the field.

Table 2. Staffing

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ Qualified (Yes or No)	Training and Development
<i>Katie Johnson</i>	01/06/08	12/31/08	25	No	• FFI Training • Veg. Monitoring in a Management Context • 40 hours Supervisory Training • S-390 • First Aid & CPR
<i>Joel Silverman</i>	04/28/08	12/06/08	15	No	• Completed FEMO taskbook • S-390, fire refresher • Plant ID refresher • Presented poster at Fire Ecology & Management Conference
<i>Katie Walsh</i>	4/28/08	10/30/08	12.5	No	• Completed FEMO taskbook • L-280, S-271, S-215, fire refresher • First Aid & CPR • Plant ID refresher • Initiated Online GIS course
<i>Andrew Ruiz</i>	5/19/08	08/21/08	8.5	No	• S-290, fire refresher, L-280 • Plant ID refresher • First Aid & CPR
<i>Todd Searle</i>	7/21/08	08/28/08	3	No	• Northwestern University Internship

Fire effects crew accomplishments and areas of focus

Table 3. Fire Effects Crew Accomplishments/Focus Areas

Category	Percent Time	Notes
FMH plots	65%	• Plots at both Zion and Bryce Canyon NPs
WUI plots	0%	
CBI plots	0%	
Other plot work	<5%	• Sampled vegetation for a study of fire effects on small mammal populations within one of our prescribed burn units. • Assisted with a study on post-fire treatments designed to minimize cheatgrass invasion (NAU plots).
Fire Assignments	15%	• Crew assisted with 6 prescribed fires, including several multi-day/high complexity burns. Assisted in monitoring, holding, and igniting, among other duties. • Provided engine staffing to fill gaps in coverage during times of peak fire

		danger. • Assisted engine on several initial attack fires in/ near Zion. • Assistant FE did a two-week detail with the Color Country crew. • Crew member did a two-day detail with the Color Country crew. • Lead FE joined the Zion Fire Use Module for a two week detail. • Intern assisted Public Information Officer on Rx in Bryce. • Assisted with Golden Spike NHS research burn
Fuels Project work	<5%	• Assisted in hazard fuels reduction projects
Data entry	10%	• Data entered into FFI • Created various spreadsheets to assist others with FFI quirks
Data conversion	0%	
Data analysis	0%	
Supervision/Admin	<5%	• Payroll • Mid-season and end of season evaluations (EPAP's)
Training	5%	• First Aid & CPR, Plant ID Refresher • S- 390, 290, 271, 215, L-280 • Online GIS course
Miscellaneous	<5%	• Completed preliminary prescribed fire monitoring reports • PT • Travel • Working herbarium project

Fire ecologist accomplishments and areas of focus

As the first season with a new Fire Ecologist and Lead Fire Effects Monitor has come and gone, we have learned a great deal. And more importantly, we have learned that there is much we still don't know!! With that said, now we as a crew are able to put forth our efforts into using our new found knowledge to assist with fire management decision making.

The 2008 season was filled with training- training a new Lead Monitor, a new Assistant Lead Monitor, and several crew members as trainees or detailers. Because of this, the new Fire Ecologist spent much of her time in the field to make the transition of crew leadership a smooth one. As that was the case, much of the fire ecologist duties, as they were slowly being learned, were pushed back into the early fall. With wildfire season coming to a close, prescribed fire season began abruptly. With the help of the Grand Canyon Fire Effects Crew we were able to complete all immediate post-burn reads on the Bryce Canyon Puma RX before the snow flew. The crew, as well as the ecologist, was kept very busy monitoring prescribed fires as well as writing their supporting reports. With such a busy RX season this fall, data entry and analysis came at a much later date than expected. After web presentations and perusing the FFI forum, the new database finally became more user friendly. Excel was the software of choice to export to and then manipulate the fire effects data. For the new ecologist, there is still much to be gained both through experience and training, as well as from those that sat in the seat before her.

Table 4. Fire Ecologist Accomplishments/Focus Areas

Category	Percent Time	Accomplishments/Focus Areas
Planning	10%	• Initial FY09 Zion Fire Management Program planning • Prescribed Fire burn plans – resource management objectives • Established reliable botanical support from local botanists
Presentations	1%	• Southern Utah Native Plant Society “Firescaping”
NPS Meetings/task groups	5%	• Zion Resource and Fire Management staff meetings • Kolob/Dakota BAR review meetings and field trips • Zion Wilderness Committee Meetings • Zion Resource Management Meetings
Fire Assignments	10%	• Zion NP wildland fire logistics – Duty Officer (2 shifts) • Zion NP Prescribed Fire Monitor: East Mesa RX, Canyon Grass RX, Three Finger Mesa RX (6 shifts) • Bryce Canyon NP Prescribed Fire Monitor: Residential RX and Puma RX. Public Information Officer: Residential RX (7 shifts) • Helicopter Crew Member, Six Rivers National Forest Blue 2 Fire (14 shifts)
Research	2%	• Obtained funding for GOSP fuels research project with USGS and Utah State Univ. (Matt Brooks, Eugene Schupp) • Implemented Golden Spike research burns
Data entry	2%	• Tried to grasp quirks of FFI data entry and address on forum as necessary
Data analysis	10%	• FFI data exporting • Excel data importing and analysis
Supervision/Admin	45%	• Hired, trained, and supervised Zion Fire Effects staff (4) • Managed Fire Effects budget • Equipment inventory purchase/replacement • Completed mid and end of season performance reviews (EPAP’s) • Program/office/data organization and logistics • Annual report preparation • Fire operations/planning support
Training	10%	• The Nature Conservancy course “Vegetation Monitoring in a Management Context,” in FL • FFI Training in Sacramento, CA • S-390 Advanced Fire Behavior Calculations • 40 hours of Supervisory Training • WebEX FFI presentations • Botany Refresher
Miscellaneous	5%	• Online Rangeland Ecology course – U of Idaho • PT

Projects for 2009

- Identify and update management and resource objectives for Zion and Bryce Canyon through meetings with Resource Management staff and update/alter plot protocols accordingly. Since we are moving from restoration burns to more of a maintenance burn regime in some areas, objectives need to be modified and upheld.
- Analyze data with the goal of identifying which protocols are providing answers to resource management questions and which protocols are not being used – use this information to update plot protocols or begin pilot sampling.
- Continue to learn FFI software and data entry/analysis methods
- Continue GIS projects, which include updates to plot location and fire history geodatabases
- Continue with data organization and learn methods for FFI data analysis
- Continue with updates to and organization of Working Herbarium
- Answer plot history questions (work in progress)
- Update FMH-4's
- Data Analysis for prescribed fires

2009 and extended project and program development summary

6-12 months

- ✓ Continue to organize and develop Zion Fire Effects program

The focus of this effort is multi-fold:

- Improve and establish more confidence in field plant identification
- Improve Fire Effects program organization, crew training levels, etc.
- Improve quality and scope of data collection standards
- Improve deficiencies such as botanical and statistical support
- Promote ecologically-based fire management planning process
- Complete GIS based fire and plot history coverages and metadata project

- ✓ Work cooperatively with new GIS Program Manager to update Wildland and Prescribed Fire geodatabases

12-36 months

- ✓ Develop manuscript for journal publication
- ✓ Pilot sampling to test new protocols



The Three Finger Mesa Rx burns on the East, Middle, and West Finger in October 2008 in Zion National Park – view looking to the northwest.

Management Objectives and Monitoring Results 2008

Table 5. Zion National Park Management Objectives and Monitoring Results 2008

<u>Monitoring Unit</u>	<i>Management Objectives</i>	<u>Monitoring Results</u> (n = # of plots)	Management Objectives Achieved?
Ponderosa Pine FPIPO1T09	Reduce needle and duff layer by 40-60% (immediate post burn)	47% decrease for 01 Post (n=19) and 44% decrease for 02 Post (n=12) in litter and duff total	YES - 70% litter & 39% duff reduction for 01Post YES – 60% litter & 28% duff reduction for 02 Post
	Reduce 1,000 hour fuels by 40-80% (immediate post burn)	1% reduction for 01Post (n=19) and 39% reduction for 02Post (n=12)	NO – Although second entry burns did provide greater 1000 hour fuel consumption
	Lower brush cover height by 40% (1 year post burn)	13% decrease in live brush height for 01Post (n=17) and 35% decrease for 02Post (n=6)	NO – Minor decrease in height after first treatment; however second entry burn proved more successful.
	Attain 30-60% mortality of live ponderosa pine 4-12" DBH (5 years post burn)	17% decrease in 6-12" size class (n=14)	NO - More intensity likely needed to achieve objective (only 6-12" DBH trees analyzed)
	Limit mortality of ponderosa pine greater than 24" DBH to 20% (5 years post burn)	100% increase (n=14)	YES - Increases likely occurred from growth in smaller DBH size classes
Quaking Aspen FPOTR1T02	Reduce fuel load 40-70% immediate post burn	4% decrease (n=9)	NO - Treated during wet conditions, snow on north aspects and in some of the plots; however, with plot burned in Fall '07 achieved 30% decrease in fuel load
	Reduce overstory tree (POTR) density 20-50% within 5 years post burn	35% decrease in POTR (n=10)	YES – Acceptable decrease in aspen overstory

<u>Monitoring Unit</u>	<i>Management Objectives</i>	<u>Monitoring Results</u> (n = # of plots)	Management Objectives Achieved?
	Increase seedling and pole density/regeneration 15-40% within 5 years post burn	96% increase seedlings 30% decrease poles (n=10)	NO – Over-achieved in seedlings and decreased poles for all species lumped together (also, wet conditions and area has browsing by deer and elk)
White Fir FABCO1T10	Reduce fuel load 50-80% immediate post burn	54% decrease (n=4)	YES
	Limit the reduction/mortality of overstory trees (ABCO) to 30-50% within 5 years post burn	67% decrease in ABCO at YR02 (n=3)	NO - Overachieved reduction objectives in white fir
Gambel Oak FQUGA1T06	Reduce fuel load 30-80% immediate post burn	42% reduction 01Post (n=11) and 20% reduction for 02Post (n=6)	YES – Overall; however second treatment (majority in Three Finger Mesa RX) did not achieve objective – did not burn as hot
	Reduce oak (QUGA) density of all size classes by 25-80% in 1 year	79% increase seedlings in QUGA 44% decrease poles in QUGA 31% decrease overstory in QUGA (n=11)	YES and NO - Increase in seedlings likely due to fire re-sprouting response
	Limit Ponderosa overstory mortality to <50% within 2 years	10% increase (n=11)	YES - Increases likely occurred from growth in smaller DBH size classes
Juniper and Pinyon FJUOS1T06	Reduce overstory tree density by 20-40% within 1 year post burn	2% decrease in pinyon & juniper species (n=6)	NO
	Reduce brush density by 5-25% within 1 year post burn	24% increase (n=6)	NO

<u>Monitoring Unit</u>	<i>Management Objectives</i>	<u>Monitoring Results</u> (n = # of plots)	Management Objectives Achieved?
	Reduce seedling and pole sized trees by 5-20% within 1 year post burn	17% decrease seedlings 0% change poles (n=6)	YES and NO – Fires likely haven’t burned hot enough to achieve desired pole mortality
Sage Brush BARTR1T06	Reduce brush density by 40-80% within 2 years post burn**	68% decrease (n=10)	YES
	Increase native grasses and forbs in 5-10 years by >10% cover	28% increase (n=9)	YES
Ripgut Brome GBRDI1T02	Reduce Ripgut Brome (BRDI) and Cheatgrass (BRTE) density 100%	81% decrease in BRDI at YR02 1232% increase in BRTE at YR02 (n=4)	NO – Partial decrease in ripgut brome offset by dramatic increases in cheatgrass and Russian thistle (overall non-native density decreased by 29%)
	Increase relative cover of native vegetation 30-40% within 5-10 years post treatment	51% increase at YR02 (n=4)	YES – Over-achieved by increasing relative cover more than expected (no year 5 data yet—analysis run with year 2 data)

All results shown are 80% confidence intervals of the mean. * Not all plots have been treated with fire for some of these variables and all of them have not been evaluated for minimum sample size for plots related to these variables.

Table 6. Bryce Canyon National Park Management Objectives and Monitoring Results 2008

<u>Monitoring Unit and Code</u>	<i>Management Objectives</i>	<u>Monitoring Results</u> (n = # of plots)	Management Objectives Achieved?
Mixed Conifer FABCO1G08	Reduce total fuel load by 20-50% immediate post burn	63% reduction 01Post (n=16) and 32% reduction for Puma RX (n=14)	YES and NO – Over achieved overall, however achieved objective for Puma RX.
	Reduce White Fir (<i>Abies concolor</i>) pole density by 10-20% within 2 years post burn	52% decrease (n=12)	NO - Significantly over-achieved, however objective is probably too low - decrease may be acceptable with even more mortality needed
	Reduce White Fir seedling density by 20-40% within 1 year post burn	79% decrease (n=12)	NO - Significantly over-achieved, however objective may be too low - decrease may be acceptable with even more mortality needed
	Increase Quaking Aspen (<i>Populus tremuloides</i>) seedling density by 30-70% within 2 years post burn	Increase from 0 to 266.7 trees/hectare occurred (n=12)	YES - A substantial increase occurred, but can not analyze % change due to no POTR seedlings present pre burn
Ponderosa Pine FPIPO1T02	Reduce total fuel load by 30-60% within immediate post burn readings	36% reduction 01Post (n=7) and 22% reduction for Residential RX (n=6)	YES and NO – Met overall objective; however, Residential RX did not achieve objective
	Decrease brush density by 40-60% within 1 year	66% increase (n=7)	No – Large increases in <i>Mahonia repens</i> and <i>Arctostaphylos patula</i> drove results
	Increase native grasses and forbs by 5-20% within 5 years**	712% increase at YR05 in % cover (n=7)	YES - Significantly over-achieved when measured in relation to percent cover

<u>Monitoring Unit and Code</u>	<i>Management Objectives</i>	<u>Monitoring Results</u> (n = # of plots)	Management Objectives Achieved?
	Limit mortality (density) to <20% of ponderosa pine greater than 24" DBH over a 5 year period	33% decrease (n=19)	NO – Decrease was from only 0.6 trees/acre pre burn to 0.4 trees/acre post burn. Density increases from 8.1 to 8.5 trees/acre with all trees 16"+ DBH
	Limit scorch height to <30'(Post Burn)	10.5' mean scorch height (n=19)	YES
Black Sagebrush BARNO1T05	Reduce brush density by 40-70% within 2 years post burn	11% increase within 1 year post burn (n=7)	NO
	Increase native grasses and forbs in 5-10 years by >10% cover	20% increase at YR05 (n=3)	YES

All results shown are 80% confidence intervals of the mean. * Not all plots have been treated with fire for some of these variables and all of them have not been evaluated for minimum sample size for plots related to these variables.