



Fire Ecology Annual Report Southern Utah Group Fire Effects Monitoring Program 2007

Summary

The summer of 2007 turned out to be yet another busy season for the fire staff at Zion National Park. The Fire Effects Monitors began the season with brush plot installations followed by the Utah Prairie Dog RX at Bryce Canyon National Park. This was the only spring prescribed fire in the network and proceeded to be the extent of our time spent at Bryce this summer. The remainder of the work was in Zion where plot reads were segmented by fire suppression actions within the park. The Fire Effects crew added firefighters and fire monitors to the effort, working on both taskbooks and GIS skills. A wildfire in the Three Finger Mesa burn unit brought with it the possibility that monitoring plots would burn “in season,” but with such a dry year and the park boundary so close, suppression actions were taken. One FMH plot, however, was burned in the West Finger Fire with positive post-burn results.

CBI data was collected using appropriate methodology on the East Mesa RX of 2006. This was a learning experience as well working from start to finish on this project. The Pine Valley Peak RX at Zion in the fall was completed in two segments. The Northgate Peaks section had previously been burned in the fall of 1999 while the Lee Valley section had burned in the spring of 2000. The Pine Valley Peak RX was, therefore, a second entry maintenance burn.

All 2007 plot data was entered into FEAT for the first and last time. Although the learning curve seemed a bit steep at times, it was accomplished without casualties. After weeks of working with FEAT, we are all very excited to see what FFI will bring us next season!



Fire Effects Monitor Ryan Muff records fire behavior during the Utah Prairie Dog RX at Bryce Canyon NP, June 2007.

Table 1. Fire Effects Plot Workload 2007

Park	Monitoring Type	Type of Plot (FMH, photo point, other)	Install and Pre-burn	Immed. Post	Postburn	Total Plots
Zion	Great Basin Sage Brush	FMH Brush Plot	0	3	1	4
	Pinyon / Juniper	FMH Forest Plot	0	0	2	2
	Ponderosa Pine	FMH Forest Plot	0	2	8	10
	Ponderosa Pine	Photo Point	0	0	3	3
	White Fir/Mixed Conifer	FMH Forest Plot	0	0	3	3
	White Fir/Mixed Conifer	FMH Forest Plot	0	0	2	2
	Quaking Aspen	FMH Forest Plot	0	1	0	1
	Gambel Oak	FMH Forest Plot	0	1	4	5
	East Mesa RX	CBI	0	0	19	19
Bryce Canyon	Black Sagebrush	FMH Brush plot	4	4	1	9
Total			4	11	24	58



Staffing

The 2007 Zion Fire Effects crew had a wide variety of experience and interests. While there was no dictated assistant lead, one crewmember in particular took on a variety of leadership roles to assist the lead fire effects monitor. Several members of the fire staff possessed FEMO taskbooks which we were able to accommodate during both the wild and prescribed fires in the park. Staff from the fuels and engine crews assisted with data collection in the field resulting in better collaboration and communication within the division.

A Fire Effects Monitor struggles with tape set-up in a year 10 Gamble Oak FMH plot.

Table 2. Fire Ecology Staffing 2007

Monitor	Starting Date	Ending Date	# of Pay Pds.	Training and Development	Fire Assignments
Kelly Fuhrmann	1/01/07	11/01/07	23	-Rx 310 instructor/student -online UIdaho Wildland Fire Mgmt & Ecology class -Conference presentations (3) -Acting RM Chief, Zion NP -'07 FMO Conference, Phoenix, AZ -9 th Biennial conference Colorado Plateau	-READ on Dakota Hills Complex -Dakota Hills BAER team coordination -READ on Pine Valley Peak RX
Katie Johnson	2/04/07	12/13/07	21.5	-Completed HECM taskbook -online UIdaho Wildland Fire Mgmt & Ecology class -GIS online training	-HECM with Zion Helitack to Montana and Yellowstone -FFT1 with Zion Engine 611 to CA wildfires
Akasha Faist	4/22/07	10/20/07	13	-L-280 -RX-310 -Completed HECM taskbook	-FFT2 Color Country Interagency handcrew -HECM with Zion FUM
Ryan Muff	4/22/07	10/20/07	13	-L-280 -S-290 – FEMO taskbook initiated -RX-310	-FFT2 Color Country Interagency handcrew -FEMO(t) with Zion FUM to Grand Canyon
Izaak McHenry	5/13/07	9/29/07	10	-L-280 -S-290 – FEMO taskbook initiated	-FFT2 Color Country Interagency handcrew

Fire Ecologist Activities

In late July the Dakota Hill fire complex burned almost 6,000 acres of pinyon/juniper, ponderosa pine and associated plant communities on the West Rim and in Dakota Hill vicinity near the northeast corner of Zion National Park. Kelly, the Zion Fire Ecologist, was the Resource Advisor for park on the fire and worked with Tim Duck's Type 3 team and Tony Shakka's Type 2 team. The assignment involved briefing the incident command team and field crews, coordinating with other ZNP resources, consulting on suppression actions, and post fire restoration planning. The NPS Intermountain Region BAER team was called to help assess the natural and cultural resource damage and make recommendations to the park for post fire restoration actions. The BAER team recommended similar treatments that were implemented on the Kolob fire in 2006. Restoration actions were completed in November and included 2 miles of fence work on the northeast boundary and over 3000 acres treated with Plateau® herbicide. This application of herbicide was implemented to prevent the infestation of the affected plant communities to an annual exotic grass, cheatgrass (*Bromus tectorum*). As is the case with the Kolob fire, the Dakota Hill fire complex treatment will be followed up with 3 years of monitoring by Northern Arizona University graduate students to determine the effectiveness of controlling cheatgrass in the ecosystem that was burned by the fire. The Fire Ecologist also served as the Acting Chief of Resources until June. Kelly vacated the fire ecologist position in November and took a position as the Chief of Resources Management at Bryce Canyon National Park.

Table 3. Fire Ecologist Accomplishments/Focus Areas

Category	Percent Time	Accomplishments/Focus Areas
Planning	5%	- Established hiring panel and hired ecologist replacement - Initial FY08 Zion Fire Management Program planning - Reviewed 10 ZION NEPA compliance documents - Progressed with Three Finger Mesa compliance planning - Assisted with EA for Dakota complex treatments - Established reliable botanical support from Southern Utah University
Presentations	5%	- Planning sessions for Dakota BAER project - Society for Range Management (Kolob treatment) - George Wright Society (Kolob treatment) 9th Biennial Conference for Colorado Plateau (Kolob treatment) - Kolob Articles: NR Year in Review, GWS proceedings - Kolob Terrace Community Fire Plan ecology presentation - Rx 310 class presentation
NPS Meetings/task groups	10%	- Zion Resource and Fire Management staff meetings - BRCA fuels treatment workshop - Kolob/Dakota BAR agency and university (NAU) planning sessions - Dakota BAR implementation leader orientation
Interagency work	5%	- AZ BLM/UT BLM,USFS, state fire ecology monitoring program coordination - Color Country fuels group meetings (3)
Fire Assignments	5%	- Zion NP wildland fire logistics – Duty Officer (12 shifts) - ZION NP Pine Valley Peak Rx READ - Dakota Hill wildfire Resource Advisor (14 shifts)
Research	5%	- Revise FMH4 Description Sheets for ZION - Obtained funding for GOSP fuels research project with USGS and Utah State Univ. (Matt Brooks, Eugene Schupp)
Data entry	0	Completed by Fire Effects Monitors
Data analysis	0	Completed by Lead Fire Effects Monitor
Supervision/Admin	20%	- Hired and co- supervised Zion Fire Effects staff (4) - Managed Fire Effects budget - Equipment inventory purchase/replacement - Completed mid and end of season performance reviews - Program/office/data organization and logistics - Annual report preparation - Fire operations/planning support
Training	4%	RX 310 course establishment and coordination at ZION
Miscellaneous	40%	Acting Chief of Resources Management – Zion NP (November 2006 to June 2007)

Table 4. Fire Effect Crew Accomplishments

Category	Percent Time	Notes
FMH plots	23%	• ZION, BRCA • Includes CBI plots in East Mesa RX 2006
Fire Assignments and Fuels Projects	35%	• Crewmembers served as FEMO and FEMO(t) for 8 shifts each on 2 RX burns in Zion and Bryce Canyon • Crewmembers assisted the Zion engine and fuels crew on severity • Crewmembers served up to 11 shifts in various capacities on Dakota Hills Complex and West Finger fires in Zion NP • One crewmember served as HECM trainee with Zion Helitack on Type 1 fire in Montana • Three crewmembers served as FFT2s on Color Country Interagency Hand Crew
Data entry & management	18%	• Spent time with species code clean up and learning FEAT quirks • Analysis of dNBR data to create CBI plot locations
Data Analysis	2%	• Little analysis due to 2nd and 3rd entry post burn reads
Supervision/Admin	3%	• Hiring, performance reviews, personnel issues • Field scheduling and prep, travel, purchasing
Fire History Project	2%	• Lead Monitor detailed with Zion GIS Dept. to clean up Zion Fire History Database for 2 pay periods
Training	7%	• Included 3 NWCG courses, FEAT same time, Trimble GPS, and botany training
Miscellaneous	10%	• Data archival project • Annual reports • Working and Digital Herbarium clean-up, plant identification • Plot location/Burn Unit map creation in GIS

Projects for 2008

- Learn FFI software and data entry/analysis methods
- Continuing GIS projects include updating plot location and fire history geodatabases
- Continue with data organization and learn methods for FFI data analysis
- Contribute Digital Herbarium to PLANTS National Database
- Answer plot history questions
- Update FMH-4's

2008 and extended project and program development summary6-12 months

- ✓ Continue to organize and develop Zion Fire Effects program (Time: Ongoing)

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
- ✓ Develop and implement GIS/GPS technology for Fire Effects program (Time: FY08)

The focus of this effort is to develop the GIS/GPS element of the Fire Effects program

- Establish a mostly self sufficient GIS/GPS program
- Continue to develop fire and plot history coverages

12-36 months

- ✓ Develop manuscript for journal publication



A member of the Zion Fire Use Module ignites through Ponderosa Pine during the Utah Prairie Dog RX, Bryce Canyon NP, June 2007

Management Objectives and Monitoring Results 2007

Table 5. Zion National Park Management Objectives and Monitoring Results 2007

<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)	55% decrease in litter and duff total (n=19)	YES - 70% litter & 39% duff reduction
	Reduce 1,000 hour fuels by 40-80% (immediate post burn)	9% reduction (n=19)	NO - Further research and analysis is needed in relation to this objective
	Lower brush cover height by 40% (1 year post burn)	12% decrease in live brush height 41% decrease in live brush density (n=17)	NO* - Minor decrease in height, but more significant decrease when viewed in terms of density
	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
	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)

<u>Monitoring Unit</u>	<i>Management Objectives</i>	<u>Monitoring Results</u> (n = # of plots)	Management Objectives Achieved?
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	38.5% decrease (n=13)	YES
	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
	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	Reduce brush density by 40-80% within 2 years post burn**	68% decrease (n=10)	YES

<u>Monitoring Unit</u>	<i>Management Objectives</i>	<u>Monitoring Results</u> (n = # of plots)	Management Objectives Achieved?
BARTR1T06	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. [**Analysis from 2007 data.](#)

Table 6. Bryce Canyon National Park Management Objectives and Monitoring Results 2007

<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	68% decrease (n=12)	YES – Over-achieved, but is within an acceptable range
	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	39% decrease (n=7)	YES
	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)	7.8' mean scorch height (n=15)	YES
Black Sagebrush BARNO1T05	Reduce brush density by 40-70% within 2 years post burn	79% increase (n=3)	NO – only decreases for <i>Artemisia</i> species and <i>Chrysothamnus depressus</i> , but overall 79% increase with all species combined
	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. [Analysis from 2007 data**](#)