



Southern Utah Parks Group Fire Ecology Annual Report 2011



A. Summary

The Southern Utah parks group had a safe and productive year in 2011. The field season staff consisted of a GS-07 permanent lead fire effects monitor and three GS-05 seasonal fire effects monitors. The crew was able to complete all scheduled FMH plot reads, install 10 new fuel plots and read 15 circular fuels/tree plots at Bryce Canyon, collect CBI data at Zion NP, and read all 140 plots in the Kolob Fire cheatgrass project. A field tablet laptop borrowed from the Zion GIS lab allowed the crew to collect and enter Kolob Fire monitoring data into a preloaded database. This increased efficiency and reduced paper waste. During the season the crew assisted with two scheduled prescribed burns, the Sunset Campground RX at Bryce Canyon and the Zion Canyon Grass RX. All crew members were able to take part in at least one detail and worked on skills ranging from FFT2, FEMO and FFT1. All crew members also assisted the Zion Canyon Wildland Fire Engines with several fires within Zion Canyon and the surrounding areas.

The 5th wettest year in ZNP's recorded history was 2011, which proved to be problematic for meeting prescription windows. The park conducted three specific fuel treatment projects and assorted mechanical thinning projects in the park for a total of 276 acres treated. Wildland fire activity was light for SW Utah, with one Zion engine in Texas on severity for a majority of the season. Nine wildland fires occurred within ZNP, accounting for 219 total acres burned. The Herbs Fire in the Kolob Canyons section of the park accounted for majority at 194 acres. Two wildland fires occurred in Bryce Canyon, the Willow (human caused) and the Garden fires, totaling just less than 6 acres. The Sunset Campground Interagency RX treated approximately 660 acres of ponderosa pine forest within the park and approximately 480 acres on the Dixie National Forest.

Fire ecologist, Katie Johnson, completed her Master of Science in Forestry degree at Northern Arizona University and returned to work full time at Zion in June. Her research and changes to the data protocols will increase the efficiency and usefulness of the field data collected by the fire effects crew. Katie also worked a 30-day detail as the initial Burned Area Emergency Response Implementation Leader for Chiricahua National Monument and Coronado National Memorial after the Horseshoe 2 and Monument Fires burned through both parks in June 2011.

Lead Monitor, Katie Walsh, was the recipient of an Intermountain Region Individual Development Grant, in the amount of \$2000, to attend a Jepson Institute Herbarium Workshop with a focus on the Asteraceae family. This course helped Katie, and in turn the entire crew, to distinguish between many of the [DYC's](#) in the field. Katie Walsh also earned a Safety Award for her safe leadership out in the field among many hazardous situations. The fire effects program continued to help support the development of the Zion working herbarium. An intern from the Chicago Botanical Gardens worked closely with the vegetation crews and the fire effects crew to collect and catalog herbarium specimens from the park. In contrast to the park's curatorial herbarium, the working herbarium allows researchers, volunteers, and field crewmembers easy access to plant specimens for education or verification. The project is several years in the process and has about 1100 plants for use at this time.



Ponderosa pine seedling regeneration from the 2010 Subway Fire at Zion NP.

Table 1. Fire Effects Plot Workload (2011) and Total Plots Installed

Park	Monitoring Unit	Plot Type (FMH Brush plot, photo point, CBI, etc.)	Pre-burn	Immed. Post	Post-burn (1-20 yrs.)	Annual Total	Total Plots
Zion	Ponderosa Pine	FMH Forest Plot	-	-	4	4	19
Zion	Sagebrush	FMH Brush Plot	-	-	8	8	20
Zion	Gambel Oak	FMH Forest Plot	-	-	-	-	12
Zion	Juniper Woodland	FMH Forest Plot	-	-	2	2	8
Zion	Aspen	FMH Forest Plot	-	-	-	-	10
Zion	White Fir	FMH Forest Plot	-	-	-	-	10
Zion	Kolob Fire	Cheat grass treatment plots	-	-	140	140	140
Zion	East Entrance	Photo Point	-	-	3	3	5
Zion	Pocket Mesa	Fuel Transects	-	-	-	-	9
Zion	Zion Grass RX	Photo Point	-	-	3	3	3
Zion	Subway Fire	CBI	-	-	15	15	62
Bryce	White Fir	FMH Forest Plot	-	-	-	-	18
Bryce	Ponderosa Pine	FMH Forest Plot	-	4	7	11	23
Bryce	Black Sage	FMH Brush Plot	-	-	2	2	7
Bryce	Dave's Hollow RX	Tree Density Ponderosa Pine	-	-	15	15	15
Bryce	Dave's Hollow RX	Photo Points	-	-	3	3	3
Bryce	RX and WF	CBI	-	-	-	-	45
Bryce	Sunset RX	Fuel Transects	10	10	10	10	10
Golden Spike	Sagebrush	FMH Brush Plot	-	-	2	2	10
Total FMH	---	FMH Plots	-	4	25	29	137
Plot Total	---	All Plot Types	10	14	214	218	429

Table 2. Fire Ecology Staffing 2011

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ Qualified (Yes or No)	Training and Development
Katie Johnson Fire Ecologist	N/A	N/A	26	Yes	Completed M.S. in Forestry at NAU
Katie Walsh Lead Monitor	2/28/2011	11/05/2011	18	Yes	Supervisory Skills training, IQCS training, Wilderness Forum at Zion, Jepson Institute-Asteraceae Workshop at UC Berkeley
Isadora Albert Monitor	4/11/2011	9/22/2011	12	No	S290, B3, L131
Elizabeth Dodson Monitor	4/11/2011	9/29/2011	12.5	No	S290, S212, B3, L131
Catherine Tennal Monitor	5/23/2011	9/29/2011	9.5	No	S130, S190, L180, I100, S212, B3



Zion Canyon Grass RX

Table 3. Management Objectives and Monitoring Results

Table 3a Zion National Park Management Objectives and Monitoring Results 2011

Monitoring Unit	Management Objective (Restoration)	Monitoring Results (20% confidence interval)	Objective Achieved?	Year of Analysis
Ponderosa Pine FPIPO1T09	Reduce needle and duff layer by 40-60% (immediate post-burn)	1 st burn, reduction: 43 to 67% (<i>n</i> =19 plots) 2 nd burn, reduction: 38 to 69% (<i>n</i> =13 plots)	Yes; perhaps slightly over-achieved Yes; perhaps slightly over-achieved	2009
	Attain 30-60% mortality of live ponderosa pine 4-8" DBH (5 years post-burn)	1 st burn, mortality: 20 to 41% (<i>n</i> =17plots)	Yes, perhaps slightly low	2011
	Reduce 1,000 hour fuels by 40-80% (immediate post-burn)	1 st burn, reduction: 3% INCREASE to 31% DECREASE (<i>n</i> =19 plots) 2 nd burn reduction: 11 to 91% (<i>n</i> =13 plots)	No Uncertain; minimum sample not achieved	2009
	Lower brush cover height by 40% (1 year post-fire)	1 st burn, reduction: 15 to 40% (<i>n</i> =18 plots) 2 nd burn, reduction: 6 to 45% (<i>n</i> =12 plots)	No No	2009
Quaking Aspen FPOTR1T02	Reduce fuel load 40-70% immediate post-burn	1 st burn total fuel reduction: 4 INCREASE to 4% DECREASE (<i>n</i> =7 plots)	No; aspen groves barely burned	2009
	Reduce live overstory tree (POTR) density 20-50% within 5 years post-burn	1 st burn, reduction: 26 to 46% (<i>n</i> =9 plots)	Yes, BUT NOT DUE TO FIRE; Rx burn was too damp to ignite the aspen groves.	2009
	Increase seedling and pole density/regeneration 15-40% within 5 years post-burn	Pole density: 7% INCREASE to 66% DECREASE (<i>n</i> =9 plots) Seedlings density: 46 to 192% increase (<i>n</i> =9 plots)	No; minimum sample not achieved; no fire in groves. Yes, BUT NOT DUE TO FIRE; no fire in groves; also, minimum sample not achieved.	2009

White Fir FABCO1T10	Reduce fuel load 50-80% immediate post-burn	Total fuel reduction = 28 to 70% (<i>n=4 plots</i>)	Borderline; 49% mean fuel reduction	2009
	Limit the reduction/mortality of overstory trees (ABCO) to 30-50% within 5 years post-burn	Overstory reduction = 14 to 118% (<i>n=3 plots</i>)	Uncertain; minimum sample not achieved	2009
Gambel Oak FQUGA1T06	Reduce total fuel load 30-80% immediate post-burn	Fuel Reduction: 29 to 54% (<i>n=11 plots</i>)	Yes	2009
	Reduce oak (QUGA) density of all size classes by 25-80% in 1 year	Seedling <i>increase</i> : 45 to 154% (<i>n=11 plots</i>) Pole size reduction: 22 to 65% (<i>n=11 plots</i>) Overstory reduction: 3 to 59% (<i>n=11 plots</i>)	No, <i>increased</i> seedlings; resprouts and seedlings are both included in this count; also, minimum sample not achieved Yes, but minimum sample is borderline. No, but minimum sample not achieved	2009
	Limit ponderosa overstory mortality to <50% within 2 years	Reduced by 5 to 28% (<i>n=18 plots</i>)	Yes	2009
Juniper and Pinyon FJUOS1T06	Reduce overstory tree density by 20-40% within 1 year post-burn	Reduced by 4 to 33% (<i>n=8 plots</i>)	No	2009
	Reduce brush density by 5-25% within 1 year post-burn	Brush reduction: 6 to 76% (<i>n=8 plots</i>)	Probably, but minimum sample not achieved	2009
	Reduce seedling and pole sized trees by 5-20% within 1 year post-burn	Seedling reduction: 16 to 44% (<i>n=8 plots</i>) Pole reduction: 10 to 62% (<i>n=8 plots</i>)	Probably, but minimum sample not achieved Uncertain; minimum sample not achieved	2009
Sagebrush BARTR1T06	Reduce brush density by 40-80% within 2 years post-burn	Brush density reduction: 49 to 80% (<i>n=10 plots</i>)	Yes	2009
	Increase native grasses and forbs in 5-10 years by >10% cover	Increase in cover 10 yrs post fire: 27 to 112% (<i>n=6 plots</i>)	Yes, but minimum sample not achieved; need to review how well pre-fire grass ID was conducted too.	2009
Brome GBRDI1T02	Reduce Ripgut Brome (BRDI) and Cheatgrass (BRTE) density 100%	81% decrease in BRDI at YR02 1232% increase in BRTE at YR02 (<i>n=4 plots</i>)	NO – Partial decrease in ripgut brome offset by dramatic increases in cheatgrass and Russian thistle (overall non-native density decreased by 29%)	2009

	Increase relative cover of native vegetation 30-40% within 5-10 years post-treatment	51% increase at YR02 (<i>n=4 plots</i>)	YES – Over-achieved by increasing relative cover more than expected (no year 5 data yet—analysis run with year 2 data)	2009
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Table 3b. Bryce Canyon National Park Management Objectives and Monitoring Results 2011

Monitoring Unit	Management Objective (Restoration)	Monitoring Results (20% confidence interval)	Objective Achieved?	Year of Analysis
Ponderosa Pine FPIPO1T09	Reduce total fuel load by 30-60% within immediate post-burn	2 nd entry burn: 14 to 88% decrease (<i>n=10 plots</i>) 3 rd entry burn: 7% INCREASE to 44% DECREASE (<i>n=5 plots</i>)	Uncertain; minimum sample not achieved No; mean was 18%	2011
	Increase native grasses and forbs by 5-20% within 5 years	2 nd entry burn: 7% DECREASE to 15% INCREASE (<i>n=10 plots</i>)	Uncertain; minimum sample not achieved	2009
Ponderosa pine Dave's Hollow	Consume 50 – 100% needle-cast post-burn	1 st entry burn: 36 - 63% decrease (<i>n = 15 plots</i>)	Uncertain; minimum sample not achieved (22 plots)	2011
	Reduce pole-sized ponderosa pine by 50% within 2 yrs. post-burn	Undetermined		2012
Mixed Conifer FABCO1G08	Reduce total fuel load by 20-50% immediate post-burn	2 nd entry burn: 22% decrease (<i>n=12 plots</i>)	Yes	2010
	Reduce White Fir (<i>Abies concolor</i>) pole density by 10-20% within 2 years post-burn	2 nd entry burn: 31% reduction (<i>n=12 plots</i>)	Yes	2010
	Reduce White Fir seedling density by 20-40% within 1 year post-burn	2 nd entry burn: 6 to 42% decrease (<i>n=12 plots</i>)	Yes	2010
	Increase Quaking Aspen (<i>Populus tremuloides</i>) seedling density by 30-70% within 2 years post-burn	Only 1 POTR seedling found in 1 plot (<i>n=12</i>)	No	2010

B. Fire Ecologist Accomplishments and Areas of Focus

Table 4. Fire Ecologist 2011 Accomplishments/Focus Areas

Category	Percent Time	Accomplishments and/or areas of activities
Planning	5	FMP, EA, EIS, CE, section 7 consultation, monitoring plan, burn plan development & review, etc.
Presentations	5	Scientific meetings, park staff, public: Master's defense, park presentation, IMR AFE Conference, George Wright Conference, webinars
NPS Meetings/task groups	2	Within park meetings; regional fire ecologist meeting
Interagency work	5	LANDFIRE, Inventory & Monitoring Network collaboration.
Wildfire assignments	15	30-day detail to Coronado National Memorial and Chiricahua National Monument for BAER assignment
Prescribed fire projects	2	Zion Grass RX – READ. Sunset Campground RX - PIO
Non-fire fuels projects	0	
Research	20	Treatment effectiveness monitoring analysis at NAU;
Data collection	2	Kolob fire Cheatgrass plots, BRCA Sunset RX FMH plots; Subway fire CBI
Data entry	<5	From paper to FFI for 2011. Archival data entry and re-entry issues.
Data analysis	10	Completed data summaries for Bryce Canyon, and for two prescribed fire. Completed using FFI and Excel.
Supervision/Admin	5	Hiring, supervision, payroll, travel authorization/vouchers, purchasing, etc.
Training	20	Refresher, webinars, NAU course work
Travel out-of-park for plot or project work	1	Travel to and from BRCA
Miscellaneous	5	PT; annual leave; RAWs maintenance and installation (4 stations).



Herb Fire at Zion National Park, burning on an isolated mesa in Kolob Canyons section – September 2011

C. Fire effects crew accomplishments and areas of focus

Table 5. Fire Effects Crew 2011 Accomplishments/Focus Areas

Category	Percent Time	Notes
FMH plots	20	Data was collected from 29 FMH plots this year; 14 at Zion, 13 at Bryce and 2 at Golden Spike NHS
WUI plots	0	
CBI plots	<5	Subway Fire at Zion (2010)
Other plot work	15	Kolob Fire Monitoring Plots-140, Photo Points-5, Sunset RX Fuels Plots-10, Dave's Hollow RX Tree Density/Fuels Plots-15
Wildfire assignments	25	Lead - Detail with Zion Wildland Fire Module FFT1(T)- 21 shifts - Engine Assist on Wildfire FFT2, FFT1(T)- 5 shifts Crew - Detail with Zion Wildland Fire Module FFT2, FEMO(T)-14 shifts - Color Country Type Two Hand Crew FFT2, FEMO(T)- 46 shifts - Engine Assist on Wildfire FFT2- 12 shifts
Prescribed fire projects	<5	Sunset Campground RX at Bryce Canyon- FEMO, FEMO(T), FFT2
Non-fire fuels projects	<5	Assisted with Zion RX prep and Zion WUI prep
Travel out-of-park for plot or project work	<5	Travel to BRCA and GOSP
Data entry	15	Amount of time spent entering Kolob Monitoring data was significantly reduced due to the use of a field laptop (Toughbook), which was borrowed from the Zion GIS department.
Data analysis	0	
Supervision/Admin	10	Travel, time, scheduling, hiring of seasonal crewmembers, and field prep.
Training	12	Plant Identification Skills, Fire Refresher, Basic Fire School (S130, S190, L180), I100, S290, L133, B3, S212, ESRI courses, IS700
Miscellaneous	<5	Assisting Zion vegetation crew with native seed collection, weed eradication and nursery tasks. Assisting the Herbarium Intern with plant specimen collecting, mounting and filing. Collected fuel samples at Zion NP.

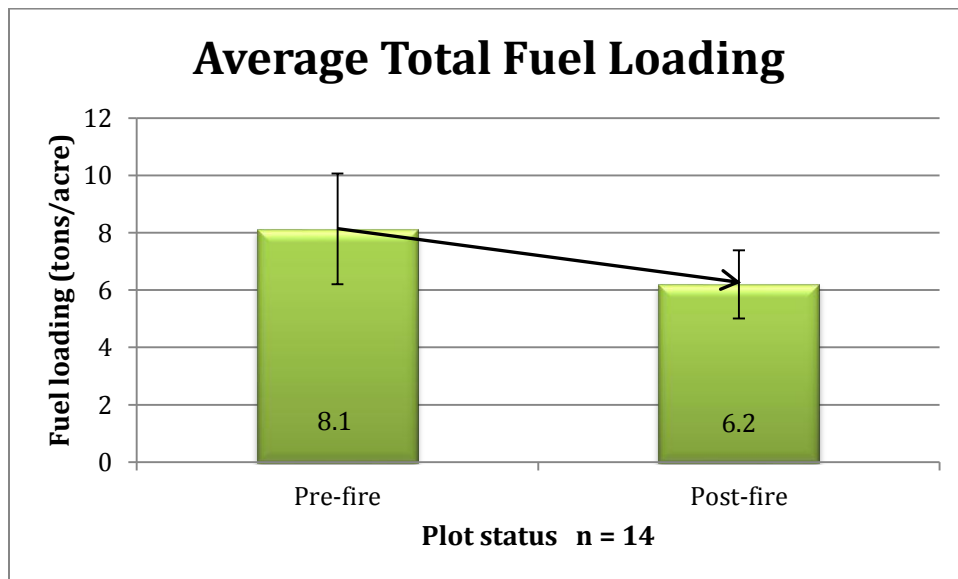
Bryce Canyon

Sunset Campground Interagency prescribed fire 2011

This interagency burn covered two operational periods from 8.17 to 8.18.2011. Four FMH plots are located within this unit, and earlier in the summer the field crew installed 10 additional fuels transects. Average burn severity was 4.4 (5 = unburned). Average initial total fuel loading was 8.1 tons per acre and immediate post-fire was reduced to 6.2, a 24% decrease.

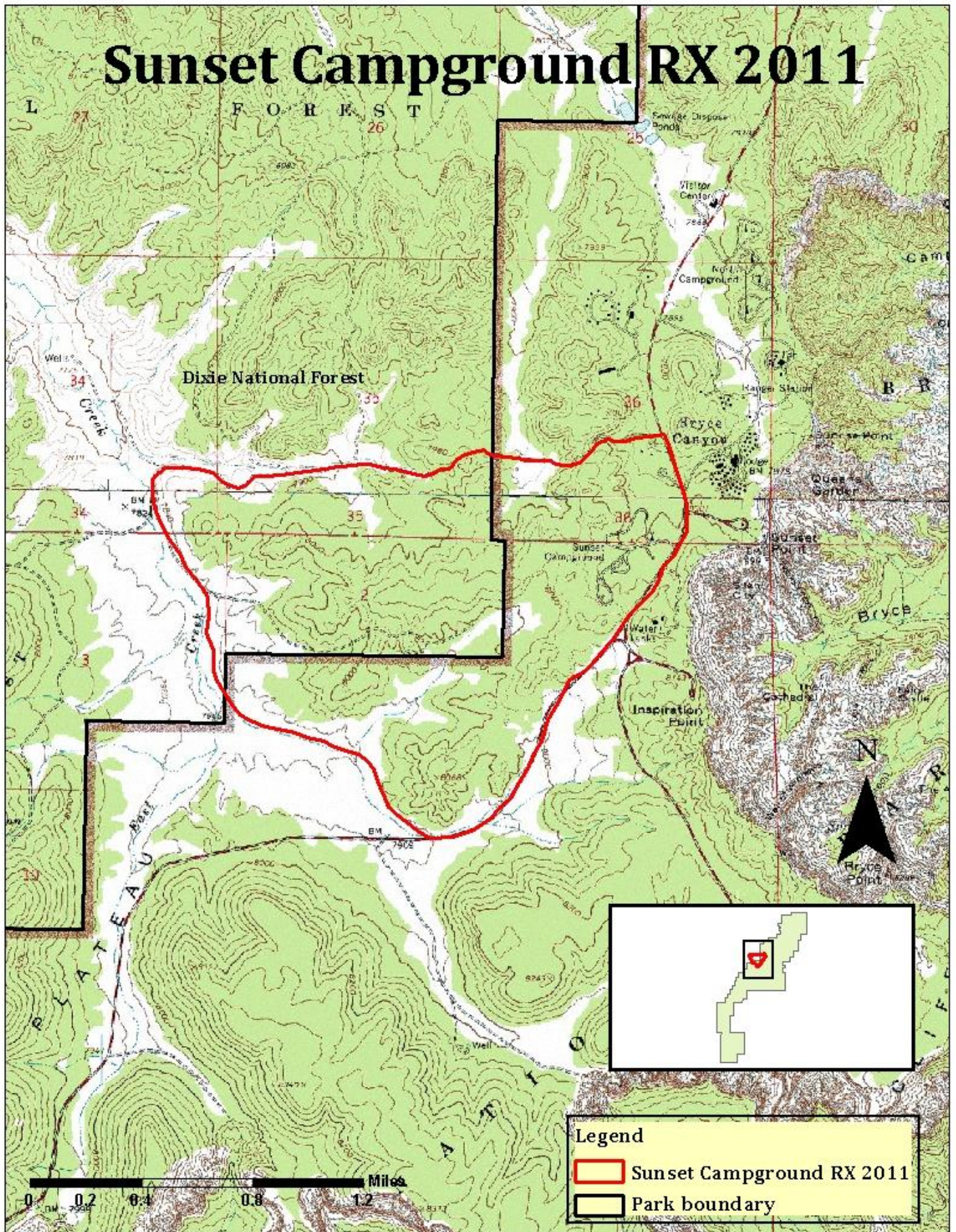


Sunset Campground RX pre-fire and immediate post-fire plot photos.



Average total fuel loading decreased 24% (+/- 11%)

Sunset Campground RX 2011



Bryce Canyon

**Dave's Hollow
Interagency
prescribed fire
323 acres**

2009



**2009
Pre-fire**



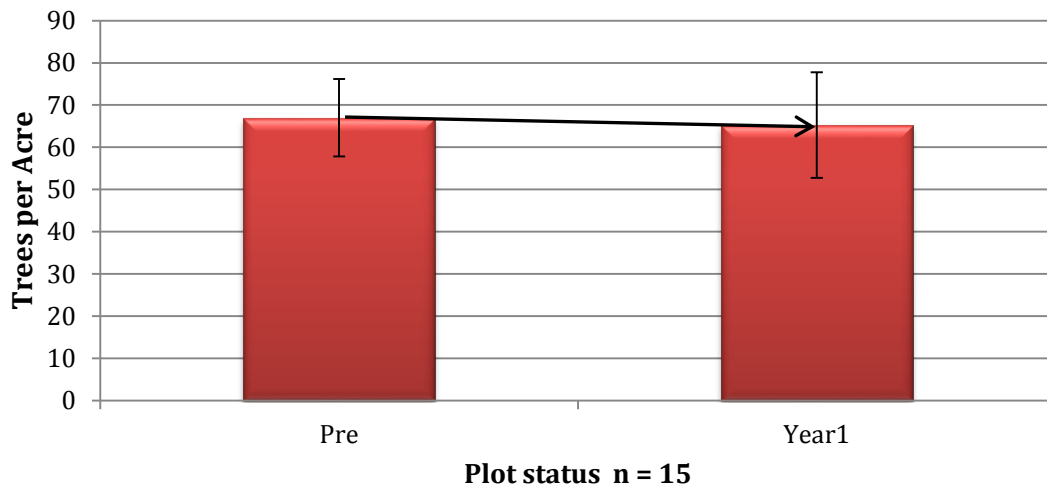
**2010
Immediately post-fire**



**2011
One year post-fire**

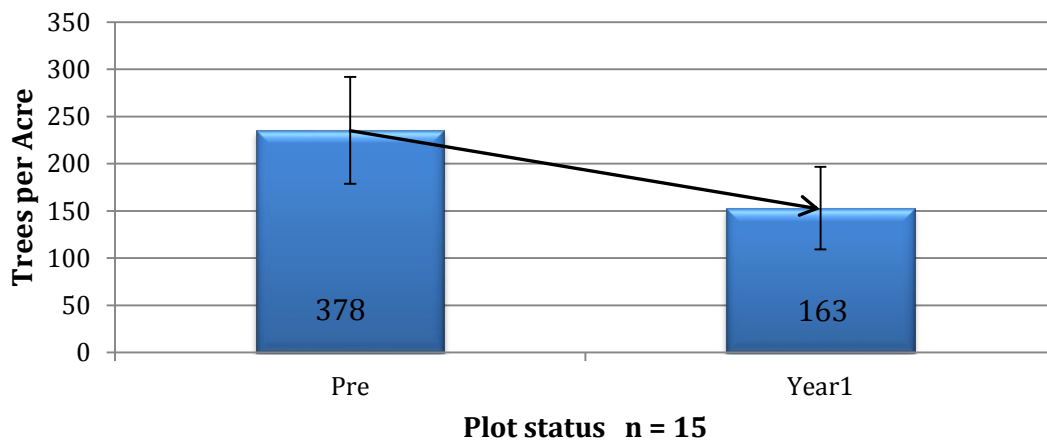
Overstory Tree Density

Average overstory
density reduction
of 6% (+/- 13%)



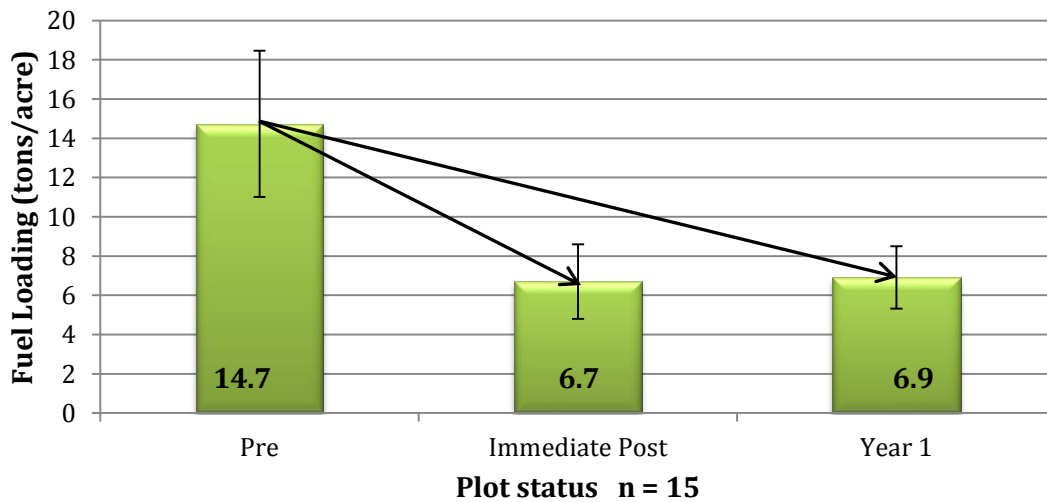
Sapling Tree Density

Average sapling
density reduction
of 45% (+/- 14%)

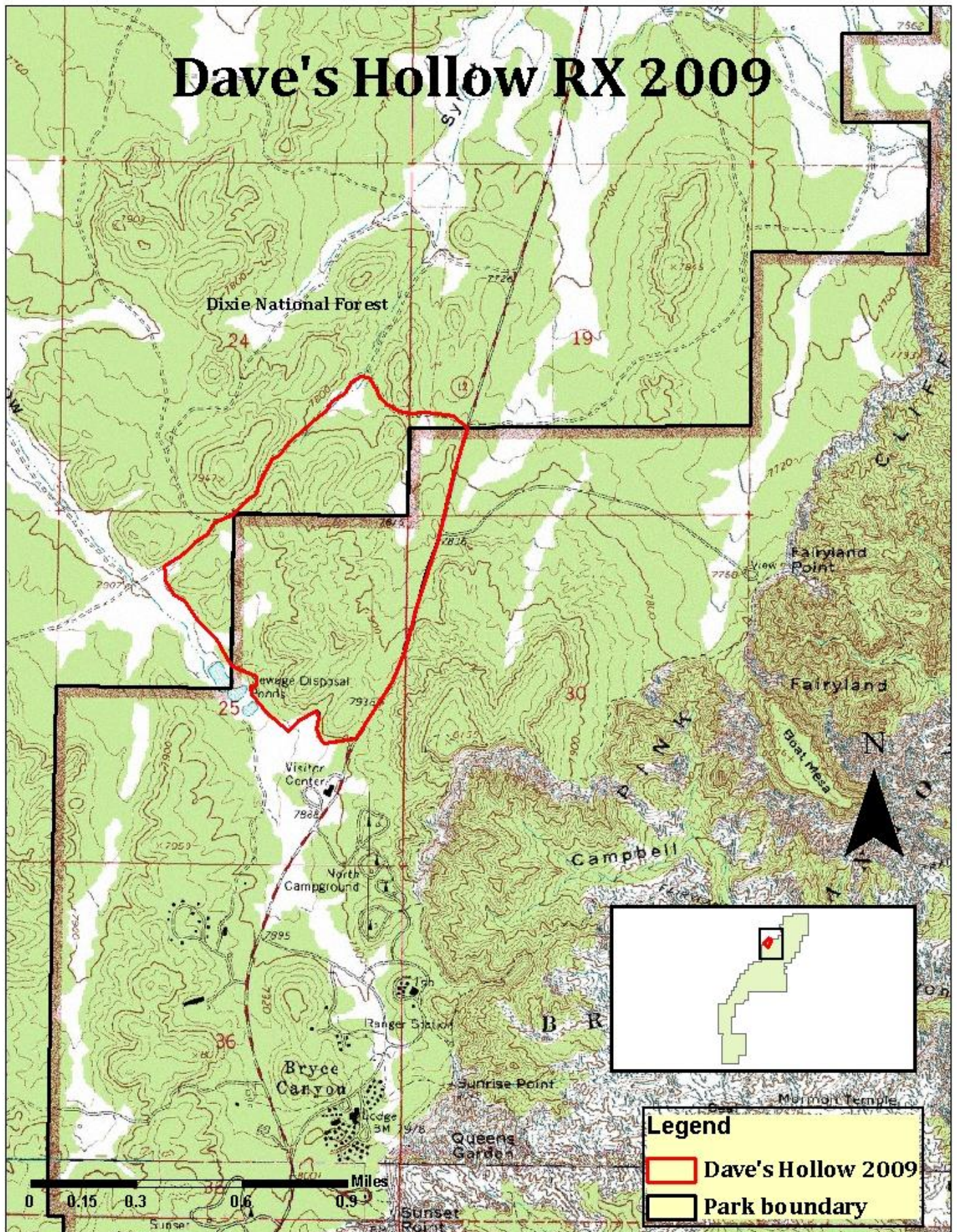


Average Total Fuel Loading

Average total fuel
reduction of 55%
(+/- 13%)
immediately post-
fire



Dave's Hollow RX 2009



D. Additional Program Information

Table 6. Planning - 2011

Park	Does Park have written DFCs? (yes or no)	Date Park-level Monitoring Plan completed (or revised)	Total # of Project- or Community-level Monitoring Plans (not just 2011)	Assisted with how many BAER plans in 2011?
Zion National Park	Yes (not refined)	2004	0	0
Bryce Canyon National Park	Yes (not refined)	2004	0	0
Golden Spike National Historic Site	Yes (not refined)	2004	0	0

Table 7. Monitoring - 2011

Park	% 2011 Data Entered	% 2011 Data Quality Checked	# Prescribed Fires Monitored*	# Non-fire Fuels Treatments Monitored*	# Wildfires Monitored *	# BAER Treatments Monitored*
Zion National Park	100	100	3	0	1	1
Bryce Canyon National Park	100	100	3	0	0	0
Golden Spike National Historic Site	100	100	1	0	0	0

* Number of treatment units with treatment effects monitoring conducted. Include pre-burn and post-burn monitoring but not burn-day monitoring.



Sunset Campground RX at Bryce Canyon NP- August 2011

Table 8. Communicating Results - 2011

Park	# of Project Monitoring Reports completed in 2011	# of Annual meeting(s) with Park staff	# of Formal presentations of results	Do you use Minitab?*
Zion National Park	1	1	1	Yes
Bryce Canyon National Park	1	1	1	Yes
Golden Spike National Historic Site	0	0	0	Yes

* This information will help to assess Minitab multi-user license needs.

Table 9. Research - 2011

Park	Are research needs identified in FMP or Monitoring Plan? (yes or no)	# of Proposals Submitted in 2011	# of Proposals Funded in 2011	# of Research Projects Supported in 2011*	Additional Comments
Zion National Park	Yes	1	1	2	K. Johnson's thesis research, and Kolob fire re-treatment effectiveness
Bryce Canyon National Park	No	0	0	0	
Golden Spike National Historic Site	Sort of	0	0	0	

*Number of funded research projects, new or ongoing, supported by the fire ecology program including logistical info or support, staffing, etc.

E. 2012 Direction

Plans for the 2012 fire season are to increase opportunities for the lead monitor to complete the ICT5 taskbook in order to provide the fire effects crew as a wildland fire resource in the field for very low complexity fires (e.g. single trees). This will allow the crew to provide their firefighting skills while in the backcountry and wilderness areas, where all plots are located.

Also, protocols are being initiated to be more prescribed fire objective specific since the monitoring objectives stated within the Fire Monitoring Plan are over-arching for the monitoring type and not prescribed fire specific. For example, at Bryce Canyon with the Dave's Hollow prescribed fire the main objectives were to decrease the sapling ponderosa pine tree density and decrease the fuel loading. In order to measure this more accurately we installed 15 circular plots measuring all trees greater than 2.5 cm at dbh and 2 Brown's fuel transects. This allowed us to be more confident with the results and helped to reduce variability.

Both the Fire Management and Monitoring Plans are up for rewrite. This will be a good time for the monitoring results and recommendations from the Fire Ecologist's master's thesis to become incorporated. Recommendations include finding thresholds for each monitoring type that specify targets to attain through project implementation (e.g. trees per acre, fuel loading).

F. Optional Information

To help in the ongoing effort to improve FFI, please include any feedback or suggestions here based on your experiences using FFI.

There are certain challenges with using this database.

- When using the Query tab, if an error is realized I cannot go from this query to the data entry tab or the reports and analysis tab (e.g. to change a monitoring status) without the query clearing.
- It would be nice to be able to copy only the tree data from one sampling unit to a new one for ease of data entry and for quality assurances. Also, it would be nice to have the option to copy data over from one like protocol to another (e.g. data was entered into “trees-individual” when it should have been entered into “trees-individual (metric)”).
- In going from tab to tab the project unit selected has to be re-chosen every time. It is not remembered, which can be a hassle.
- I have found some interesting errors when I attempted to use the Query function to analyze tree data. There have been times when the basal area data did not come out correct when I looked at it in Excel.
- The only data analysis I use in FFI is percent cover in the Query tab.
- A guide for more regular data analyses that can be performed with the Query tab would be helpful. I have seen some on the FFI google group, but things like Basal Area and some others would be useful. It is not a very intuitive program.
- The FFI Users Guide would be more helpful if there was a troubleshooting section. There are several errors that are more frequent than others and it would be helpful to have explanations handy.
- It would be nice to be able to choose a pre-set filled in form such as the 1, 5, 10, 15... placement for the fuels data entry sheet to make data entry that much faster than having to enter this information every time when it seldom varies. The same would also be useful for the point-intercept veg line. I know that pre-loading this information would mean that there could be no variation to it, but it would be more beneficial if we had the ability to insert a line if there were more than one species encountered at a point.

Also, include any additional material not already covered:

- Alternative monitoring activities descriptions

We have been installing Brown’s fuels transects immediately prior to prescribed fire implementation in order to capture the most recent data. Also, for smaller burn units with no prior FMH plots installed, we have started to install plots related to specific burn and monitoring objectives. For instance, at Bryce Canyon in the Dave’s Hollow unit where fuel loading and small diameter tree mortality were the main objectives we installed 15 circular plots and collected tree and fuels data.

- Challenges facing monitoring program

The inclusion of the Kolob fire cheatgrass monitoring plots have been a small challenge due to the seasonality of the plot reads. Plots are read in the early spring right after green up of the cheatgrass. During this time there are also trainings that are concurrent, as well as other meetings and orientations. We have utilized the vegetation field crew often, and a few times the engine crewmembers have offered their assistance. We are trying to promote cross training within the fire management division so the fire effects crew can work well on the engines and the engine crew can be familiar with the fire effects vegetation plots and protocols.

- Collaboration with natural resource managers, other federal agencies, or research institutions

In an attempt to not duplicate efforts, we have worked closely with the Northern Colorado Plateau Inventory and Monitoring Network with their new plot installation within ZNP. They will install upland monitoring plots

in the park in the 2012 field season and this partnership will allow the utilization of similar datasets and collaboration in the future.

Success Story



The 240 acre East Entrance prescribed fire (above, May 2010), adjacent to the entrance station, was burned in spring 2010 for WUI and resource objectives. The decadent sagebrush (*Artemisia tridentata*) and Gambel oak (*Quercus gambelii*) within this unit was at risk for habitat loss due to previous fire suppression and wildfire risk. Vegetation management field crews and volunteers collected big sagebrush seed (which is gravitationally, not wind, dispersed) pre-fire and distributed it in the area 6 months post-fire. Over 63 lbs. of seed was dispersed within this unit in areas that were devoid of vegetation one year post-fire. Fall 2010, the exotic plant crew applied herbicide to this entire unit to slow the spread and further establishment of cheatgrass. The photo to the left (June 2011) shows the lack of cheatgrass, the abundance of perennial flowering forbs, and new big basin sagebrush growth.