



**National Park Service
Yellowstone National Park
2011 Fire Ecology Annual Report**

A. Summary

The Yellowstone fire ecology program completed another successful season full of plotting, “fire using”, fixing weather stations and fuel moisture sampling. The 2011 Fire Ecology program consisted of new Fire Ecologist Becky Smith, Lead Monitor Jess Page, and crewmembers Matt Heinz who returned for his third season, and Tim Pankey who returned for his second season.

We are very proud of the 10 FMH plot reads completed this year; it is the most this particular crew has completed in one season. Ten plots may not seem like a huge accomplishment, but when all of our other duties are taken into account, along with the combined 20 weeks the crew spent on out of park fire assignments it really is an accomplishment. In addition, the 10 plots required many hours of travel which included driving, hiking, boating, and overnight camping trips. Another large accomplishment for the 2011 season was the Lead Monitor position, filled by Jess Page, was converted from a term to a permanent!

The following is a brief summary of our accomplishments by category.

Weather

Once again the fire effects crew was in charge of collecting and updating weather, drought forecasts, indices, and reporting them to fire management personnel and agency administrators throughout the year. This requires the entire crew to have basic knowledge of WIMS and Fire Family plus.

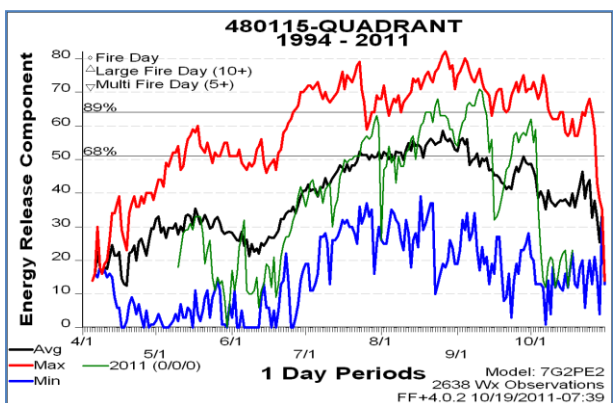


Figure 1: Annual pocket card produced by Fire Ecology program.



Figure 2: Matt Heinz working on the Soda Butte RAWS.

Every year the weather network brings us new triumphs, as well as a few challenges. During 2011 we were able to upgrade the Quadrant and Bechler RAWS with new equipment which will meet the 2013 requirement to transmit at a higher data rate. This leaves only one RAWS left to update, which will be completed during the 2012 annual station rehab. A new RAWS (Grebe) was installed on the Central Plateau to fill a data gap representing the middle of the Park, and Lead Jess Page was *finally* able to convert the manual fire weather station in Mammoth into an automated

station after two years of effort. This will now bring Yellowstone's RAWS network to six! Along with annual rehabs for two stations, set up and take down of six manual fire weather stations, and fixing RAWS tripods which had been crushed during the significant 2010-2011 snowpack, it was a busy weather station year. Next year we will evaluate the remaining five manual weather stations within the park to determine if they should be automated, or discontinued.

Wildland Fire Duties

The fire effects seasonal crewmembers had an impressive year on out of park fire assignments, which started nearly as soon as they did this season. Collectively they spent 17 weeks in AZ, NM, TX, MT, WY and MN in roles as HECM, FFT1, ICT5, CRWB(t), ENGB(t), and FEMO. These assignments



Figure 4: Tim Pankey on one of his many helitack assignments.

provided many opportunities for them to cross train with other fire disciplines, to work in a variety of fuel types, and to work on qualifications that are not readily available with in-park assignments. We also assisted the Gallatin National Forest on

two prescribed burns in the spring and fall.



Figure 3: Tim Pankey, Matt Heinz, and Becky Smith taking a break while monitoring the Gibbon fire.

Yellowstone eventually had a short fire season once the copious amounts of snow melted, which provided the crew a few opportunities to work on leadership positions, level one and two fire effects monitoring, and structure protection.

Lead Jess Page traveled to the Grand Canyon twice during the 2011 season. The first trip was to assist the GRCA fire effects crew in sampling plots within a prescribed fire unit. This trip became a great opportunity to not only help out another crew, but to also share success stories and observe how other crews function. In addition, there was great training in technological gadgetry that has yet to make an appearance in Yellowstone. The second visit to GRCA was to attend the Helicopter Training Academy and work on her Helicopter Manager taskbook.

Live and Dead Fuel Moisture Monitoring Program

Yellowstone's long term fuel moisture monitoring program has undergone some tweaks over the past few years. The Fire Ecology program is in charge of the long term fuel moisture sampling sites, which now include four fuel moisture sites sampled biweekly, and four 1000 hour log sites sampled every week. The sites around the Park represent major fuel types and elevation zones. All long term moisture data collected are uploaded to the National Fuel Moisture Database, so current data can easily be viewed on the World Wide Web by anyone who so chooses. Due to the significant snow load during the 2010/2011 winter we weren't able to start sampling one of the sites until the second week of July! We will continue to evaluate if the current long term sites are useful and necessary for our fuel moisture information requirements, and will modify the program as necessary in the upcoming years.

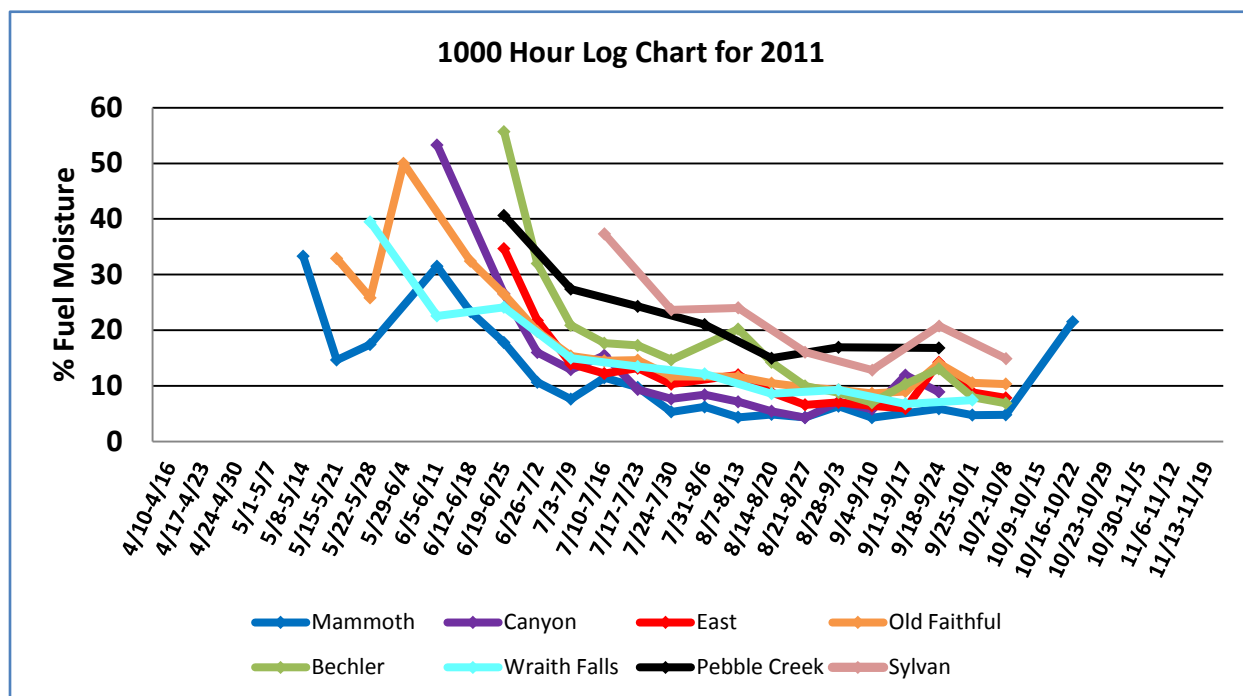


Figure 5: 1000 hour log chart created from data collected by the Fire Ecology fuel moisture monitoring program.

Monitoring Plots and Research

As mentioned above, the crew was able to sample 10 FMH plots this year. There are many challenges we face every year when attempting to sample plots. The most significant is the long distance of plots from roads and trails, as most plots were originally accessed and installed by helicopter transportation ahead of approaching UWF fires (formally known as wildland fire for resource benefit). While the distance of plots from roads is often an appeal to revisit them, it unfortunately makes for very long days and elevated stress levels due to the pressure to complete the plot in one day and hike/boat/swim/wade out before dark.



Figure 6: Matt Heinz, Tim Pankey and Jess Page getting a boat ride across Yellowstone Lake to the Promontory FMH plot.



Figure 7: Matt working on his 'freeze frame' at the Promontory FMH plot.

Of the 10 plots sampled this year, 6 were 10 year reads of plots installed ahead of naturally burning wildfires. The postburn data collected this year, along with ongoing extensive data cleanup efforts, will hopefully give us a better picture of the usefulness of our WFRB (wildland fire for resource benefit) plot network. This has been a struggle for years and we are now closer to being able to use the data, and present them to fire and resource managers in a comprehensive format.

Additionally, the crew replaced 23 temperature sensors which were originally placed throughout the Park in 2010 for Zack Holden at the Fire Science Lab in Missoula. The sensors are being used to model fine scale air temperatures in variable terrain and will assist in developing a model to enable better prediction of fire danger and fuel moistures within the Park. Lastly, the Nez Perce manual fuel treatment photo points were revisited. The photo points were installed to document a fuels reduction project in 2009, which unfortunately had significant blowdown during the 2010/2011 winter.

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

Park	Monitoring Unit	Plot Type	Pre-burn 2011	Control (unburned) 2011	Imm. Post 2011	Postburn (1-20 yrs) 2011	Annual Total 2011	Total Plots
Yellowstone National Park	Norris Rx (FLP01T08)	FMH forest	-	1	-	3	4	4
	WFRB (FWFRB1T99)	FMH forest	-	1	-	5	6	19
	Mixed Conifer (FMICO1T10)	FMH forest	-	-	-	-	-	6
	Nez Perce Fuels Treatment	Photo point	-	-	-	13	13	13
	Grant Fuel Treatment (HZF)	Rapid assessment radial WUI	-	-	-	-	-	24*
	Fuel Treatments 2002-2005 (RMECH)	Rapid assessment radial WUI	-	-	-	-	-	69
	Despain	Pre-FMH natural fire veg. and fuel	-	-	-	-	-	16
Little Bighorn Battlefield NM	No fire effects monitoring plots are currently installed at LIBI, but expect to install in 2012 or 2013		-	-	-	-	-	0
Total			1	1		21	23	151

* Pilot sampling plots

Table 2. Fire Ecology Staffing 2011

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ Qualified (Yes or No)	Training and Development
Becky Smith	EOD 2/27/11	12/31/11	22	No	MBTA Training, completed TFM, Google Earth workshop
Jess Page	2/28/11	12/01/11	20	No	S-490, S-230, I-300, Google Earth workshop, HTA for HMGB(t)
Matt Heinz	4/24/11	11/5/11	14	No	S-491, S-230, S-231, WFR, CRWB(t) assignment, ENGB(t) assignment
Tim Pankey	5/8/11	10/22/11	12	No	Google Earth workshop, FFT1(t) assignment, helitack cross-training

Table 3. 2011 Management Objectives and Monitoring Results

Monitoring Unit	Management Objective	Monitoring Results (80% confidence interval)	Objective Achieved?	Year Last Analysis Completed
Norris prescribed burn (FLP01T08)	Reduce 100 hr. and 1000 hr. fuel loads immediate postburn (POST) to < 20 tons/acre	PRE: 50.2 (38.2 – 62.3) t/ac POST: 22.7 (19.6 – 25.7) t/ac <i>(n=3 plots, 1 fire)</i>	NO* *but minimum sample size not achieved	2009
	Limit tree ($\leq 2''$ DBH) mortality two years postburn (YR02) to <50%	PRE seedling density: 12,626 (5,387 – 19,865) trees/ac PRE 1-2'' tree density: 189 (131 – 247) trees/ac <u>PRE total live 0-2'' density:</u> <u>12,815 trees/ac</u> YR02 seedling density: 621 (517 – 724) trees/ac YR02 1-2'' tree density: 113 (0 – 234) trees/ac <u>YR02 total live 0-2'' density:</u> <u>734 trees/ac</u> Difference from PRE to YR02: -94% <i>(n=3 plots, 1 fire)</i>	NO* *but minimum sample size not achieved	2011
	Monitor non-native vegetation one, two, three**, five and ten years postburn using relative percent cover **YR03 read was missed, so data collected in YR04 were used for this analysis	PRE non-native: 2.5 (0 – 6.9)% YR01 non-native: 4.8 (0 – 10.5)% Difference from PRE to YR01: +94% YR02 non-native: 0.8 (0 – 1.6)% Difference from PRE to YR02: -69.4% YR04 non-native: 9.1 (0.1 – 18)% Difference from PRE to YR04: +268% <i>(n=3 plots, 1 fire)</i>	YES* *but minimum sample size not achieved	2011

Monitoring Unit	Management Objective	Monitoring Results (80% confidence interval)	Objective Achieved?	Year Last Analysis Completed
	Monitor tree density (live trees ≥ 1" DBH) one, two, three**, five and ten years postburn **YR03 read was missed, so data collected in YR04 were used for this analysis	PRE pole density: 383 (146 – 620) trees/ac PRE overstory density: 43 (0 – 121) trees/ac <u>PRE total density: 426 trees/ac</u> YR01 pole density: 275 (0 – 794) trees/ac YR01 overstory density: 0 trees/ac <u>YR01 total density: 275 trees/ac</u> Difference from PRE to YR01: -35% YR02 pole density: 297 (0 – 857) trees/ac YR02 overstory density: 0 trees/ac <u>YR02 total density: 297 trees/ac</u> Difference from PRE to YR02: -30% YR04 pole density: 302 (0 – 872) trees/ac YR04 overstory density: 0 trees/ac YR04 total density: 302 trees/ac Difference from PRE to YR04: -29% <i>(n=3 plots, 1 fire)</i>	YES* *but minimum sample size not achieved	2011
	Monitor surface fuel loading (1 - 1000 hours and litter and duff, in tons/acre) one, two, three**, five and ten years postburn **YR03 read was missed, so data collected in YR04 were used for this analysis	PRE: 63.9 (39.7 – 88.2) t/ac YR01: 25.4 (19.2 – 31.6) t/ac Difference from PRE to YR01: -60% YR02: 32.1 (20.0 – 44.2) t/ac Difference from PRE to YR02: -49% YR04: 29.8 (15.2 – 44.4) t/ac Difference from PRE to YR04: -53% <i>(n=3 plots, 1 fire)</i>	YES* *but minimum sample size not achieved	2011

WFRB (Wildland Fire for Resource Benefits, aka Use of Wildland Fire) Plot Data

There are currently 19 WFRB plots installed within Yellowstone. The plots were installed between 1999 and 2005 to monitor the effects of WFRB fires; 11 plots have burned, and 8 plots have not burned and could be used as control plots. The new Fire Ecologist has yet to find any meaningful or measurable objectives for why these plots were installed.

A helicopter was used to install many of these plots ahead of burning wildfires, and therefore they are located in very remote parts of the Park. Because of the Park's renewed commitment to wilderness values and shrinking budgets, it is no longer feasible to use the helicopter as a means of plot travel. Some of the plots are so far in the backcountry they will most likely never be revisited because of the excessive amounts of travel time (two plus days of hiking one way) needed to reach them without a helicopter.

During 2011 the crew was able to hike or boat into six of the more reachable plots; five had burned and one had not. While data clean up and entry is still ongoing, some results are shown below. It is hoped at some point these data may provide positive scientific results to park managers, which may assist in the decision making process to allow more fires to be managed for natural processes.

Table 4. WFRB Monitoring Results

Monitoring Unit	Management Objective	Monitoring Results (80% confidence interval)	Year Last Analysis Completed
Wildland Fire for Resource Benefit (FWFRB1T99)	Monitor non-native species, using relative percent cover	PRE non-native: 5.1 (0 – 13.6)% YR01 non-native: 8.4 (0-24.2)% Difference from PRE to YR01: +63.3% YR02 non-native: 6.5 (0 – 18.7)% Difference from PRE to YR02: +26% YR03 non-native: 23.5 (0 – 61.8)% Difference from PRE to YR03: +357.8% YR04 non-native: 15.3 (0 – 36.6)% Difference from PRE to YR04: +198.7% YR10 non-native: 8.1 (2.3 – 13.8)% Difference from PRE to YR10: +57.1% (n=3 plots, 1 fire each)	2011

B. Fire ecologist accomplishments and areas of focus

Table 5. Fire Ecologist 2011 Accomplishments/Focus Areas

Category	Percent Time	Accomplishments and/or areas of activities
Planning	60%	- Helping to rewrite the Fire Management Plan (FMP) - Helped select contract company for FMP EA, including reference checks on contractors, reasons for scoring and justifications - Acting as lead quality control and cattle prod for contracted FMP EA (in process) - Prepared handout materials and maps for FMP EA initial public scoping meeting - Wrote one burn plan, coordinated smoke permits, and assisted with a CE to carry out burn - Created spreadsheet of all fuel treatment projects (manual, mechanical, rx) park has completed, hopes to complete; includes NEPA status, acres, year treated and maintenance completed, and veg./wetland/cultural surveys completed - Plot management: determined what type of plots were installed within the park, what plot data are still usable and worthwhile, created spreadsheets to easily show when they were read, and located all hard copies of plot data (which were missing!) - Assisted with, or created most WFDSS documents during fire season - Created GIS maps for some fires during initial decision process - Drafted a fire season update document for park management - Helped determine where a new RAWS would go in park - Creating a usable, park wide plant species list (there is no park species list currently)
Presentations	<1%	One presentation to a group of high school students from Ohio
NPS Meetings/ task groups	15%	- Frequent Fire and Fuel ID team meetings - Frequent internal scoping meetings for FMP - Frequent internal scoping meetings for FMP EA - Initial public scoping meeting for FMP EA in Cody, WY - Internal, pre-scoping meeting for park wide vegetation map - IMR/MWR Fire Ecologist meeting
Interagency work	0	
Wildfire Assignments	<1%	CRWB and FEMO three times on a UWF park fire
Prescribed fire projects	<1%	RXB2 for one, very small, prescribed burn within the park
Non-fire fuels projects	0	
Research	<1%	Assisted with development/data collection for a Missoula Fire Science Lab model of Yellowstone fire and climate change
Data collection	<1%	Assisted with 3.5 plots
Data entry	5%	Completed minimal data entry when I could no longer deal with WFDSS or the FMP
Data analysis	<5%	Completed minimal data analysis for this report as data are either not entered into FFI or data are not yet clean enough to use

Supervision/Admin	10%	• Supervised Lead Fire Effects Monitor and completed EPAP • Advertised and hired a Lead (converted Lead position from a term to permanent) • Assisted with trying to hire a Fuels Specialist for the Park (interviews and reference checks) • Time and travel paperwork • Credit card logs and statements
Training	5%	• Migratory Bird Treaty Act Training • Presented and passed Technical Fire Management final presentation • Google Earth Workshop • Firefighter refresher • PT

C. Fire effects crew accomplishments and areas of focus

Table 6. Fire Effects Crew 2011 Accomplishments/Focus Areas

Category	Percent Time	Notes
FMH plots	11%	• 10 FMH forest plot reads
WUI plots	<1%	• Nez Perce photo points
CBI plots	0	
Other plot work	0	
Wildfire assignments	32%	• Lead spent 2 weeks as HMGB(t) at GRCA, • One crewmember spent a total of 10 weeks on 4 assignments as: FFT2, FFT1(t), HECM, FEMO(t), ICT5(t) • One crewmember spent 7 weeks on 3 assignments as: ENGB(t), CRWB(t), and HECM • The whole crew assisted with eight fires in park as: FEMO, FFT2, FFT1, and ICT5
Prescribed fire projects	<5%	• Lead and one crewmember assisted the Gallatin NF with burn operations, as FFT1 • Lead assisted with prep and FEMO work for another prescribed burn on the GNF • One crewmember helped prep and burn a vegetation management research plot
Non-fire fuels projects	6%	• Fuel sampling
Travel out-of-park for plot work	1	• Lead traveled to GRCA to assist with FMH plot reads
Data entry	5%	• 100% of 2011 data entered and HUGE headway entering and checking pre 2007 WFRB plot data (mostly daubenmire)
Data analysis	0	
Supervision/Admin	3%	• Evaluations, payroll, travel authorization/voucher, etc.
Training	9%	• Wildland fire refresher, S-230, S-231, S-490, S-491, I-300, B3, Google Earth workshop, Wilderness First Responder, Helicopter Training Academy, radio training, IS-700, IT security, whistleblower in the workplace, chainsaw refresher

Miscellaneous	35%	• Weather station set up and rehab • NFDRS updates and WIMS configuration • ERC charts • Temperature sensor placement • Gathering info for morning meetings • Search and rescue • Leave taken, misc. office work, PT time, and janitorial duties
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D. Additional Program Information

Table 7. 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?
Yellowstone National Park	More investigation is needed	-	0	0
Little Bighorn Battlefield National Monument	More investigation is needed	-	0	0

Table 8. Monitoring - 2011

Park	% 2011 Data Entered	% 2011 Data Quality Checked	# Prescribed Fires Monitored*	# Non-fire Fuels Treatments Monitored*	# Wildfires Monitored*	# BAER Treatments Monitored*
Yellowstone National Park	100%	40%	1	1	5	0

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

Table 9. 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?*
Yellowstone National Park	0	5	0	Yes
Little Bighorn Battlefield NM	0	0	0	

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

Table 10. 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
Yellowstone National Park	No (currently rewriting FMP though, and hope to include)	0	0	2	Assisted Missoula Fire Science Lab employees with discussion and data to create YELL fire and climate change model, and temperature sensor placement
Little Bighorn Battlefield NM	Yes (currently rewriting FMP, new needs will be identified related to rx fire)	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

The Yellowstone Fire Ecology program is currently going through another transition with the arrival of a new Fire Ecologist. There are a large number of ‘willy-nilly protocol’ fire and fuel monitoring plots of suspicious data quality strewn about Yellowstone, and the goal is to find all of the data, organize it, somehow get it into FFI, and then determine what data are usable and what data are crap. Currently it is estimated only 20 percent of Yellowstone’s data are in FFI, and up until very recently when copies of data sheets were obtained from the Park’s archives, the Fire Ecology program didn’t even have all of the actual data sheets to enter the data. Once all data are in FFI it will be easier to determine the quality of data through time, and more importantly if the data are usable and useful anymore to the program.

The Fire Ecologist anticipates the program moving more towards WUI project monitoring, which may include prescribed fire treatments in the future. The biggest problem with the current set of natural fire (WFRB and Despain) plots is there are no clearly defined fire objectives identified. The Park’s main goal is to perpetuate and allow natural processes, including fire. This is not measurable and therefore deems these plots as miscellaneous information. With the current funding realities we can no longer focus on monitoring miscellaneous information, and we must strive to be as useful to our fire management program as possible. In striving to be useful, it is also anticipated the fire ecology program may begin to help complete resources surveys, such as migratory bird and wetlands, within WUI project units.

F. Optional Information

FFI Feedback and Suggestions

It would be great if the Cover/Frequency (metric) protocol codes for percent cover matched the daubenmire codes, versus us having to convert codes to averages. It may seem like a small detail, but by the end of a long day entering vegetation daubenmire data we start to find more and more errors because of this.

Alternative Monitoring Activities Descriptions

Yellowstone has 16 wildland fire monitoring plots (Despain) which were installed ahead of PNF (Prescribed Natural Fires, now Use of Wildland Fire) between 1976 and 1988. These plots are 25 meters by 15 m and include: two 25 m daubenmire transects, four fuels transects, four photopoints, overstory, sapling and seedling protocols. Most plots were burned, but a few did not and act as control plots. Eleven of these plots were most recently sampled during the 2001 field season, and have not been sampled since. In the future it may be nice to resample these plots again as the data could give us important information about long term trends of succession of plant communities based on natural fire disturbance. Unfortunately this might be a pipe dream as there are no set objectives for natural fires and this information is currently deemed as miscellaneous.

From 2001 to 2005 the crew installed 69 rapid assessment radial WUI plots (RMECH) within front country developed areas and at backcountry cabin sites. The plots were installed to monitor the success of hazard fuel treatments through the monitoring of ground fuel and canopy bulk density. Most plots were sampled immediate postburn burn, and have not been sampled since. It is hoped the plots within the front country developed areas can be sampled ten years post-cut to determine if the fuel treatments are still effective in stopping a canopy fire, or if maintenance work is needed.

In 2009 a set of 24 rapid assessment radial WUI plots (HZF) were installed within the Grant WUI treatment. They were installed as pilot sampling plots and their protocols differ slightly from RMECH plots. It is anticipated the plots will be sampled post-cut in 2012 after all of the piles are burned.

Yellowstone is currently in the process of testing a camera to remotely monitor fires. The camera can be controlled (zoom and 360° panning capabilities) from the office, and the real time images are broadcast onto a computer within the fire cache. While it is important for FEMOs to get on the ground and collect data such as fuel moistures, fire behavior, weather and perimeters, using the camera to monitor non-active fires on a daily basis has been shown to be useful for firefighter safety and budgetary reasons.

Challenges Facing Monitoring Program

A major challenge within the Yellowstone Fire Ecology program is to find a balance between sending employees on fire assignments for cost savings, and keeping them in the park to collect data. Every program is faced with smaller budgets, competing management direction, and the

give and take of what we want to get done versus what we can get done. We send employees out not only for cost savings, but to give them important fire training assignments and experiences. There's a balance between the two; we're just struggling to find it.

Collaboration with Natural Resource Managers, other Federal Agencies, or Research Institutions

In the future it is hoped the fire ecology program can collaborate more with the Inventory and Monitoring Network. This is particularly true at Little Bighorn Battlefield. LIBI is in the process of writing a new FMP and associated EA which will include the use of prescribed fire. If prescribed fire is used there, vegetation monitoring will take place and it would be great to work with the IM network to collect and share data that is useful to both programs.

Photographs of Monitoring and Fire Activities



Figure 8: The Sulphur WFRB plot preburn (PRE).



Figure 9: The Sulphur WFRB plot, one year postburn (YR01).



Figure 10: The Sulphur WFRB plot, two years postburn (YR02).



Figure 11: The Sulphur WFRB plot, three years postburn (YR03).



Figure 12: The Sulphur WFRB plot, four years postburn (YR04).



Figure 13: The Sulphur WFRB plot, ten years postburn (YR10).