NATIONAL PARK SERVICE
YELLOWSTONE NATIONAL PARK
FIRE ECOLOGY ANNUAL REPORT
CALENDAR YEAR 2009

Prepared by Jessica Page, Lead Fire Monitor
and Tonja Opperman, Fire Ecologist
December 2009

SUMMARY

The Yellowstone Fire Ecology Program collects and manages information required to successfully and safely support fire management operations in Yellowstone National Park. Monitoring staff provide the Fire Management Office with current and predicted weather and fuel conditions. The program also provides data to describe the effects of natural fire, prescribed fire, and mechanical fuel treatments on vegetation, and fuels. Information is provided to fire managers, other Yellowstone staff, and the public to provide a scientific basis for the fire management program. The Yellowstone Fire Ecology program is broadening its scope beyond vegetation, and establishing a rapport with other park disciplines that concentrate on wetland ecology, migratory birds, endemic fish, and soils because these are the primary issues that drive fire management decision-making and outcomes at Yellowstone.

STAFFING AND TRAINING

In 2009, the Fire Ecology Program included one permanent full time Fire Ecologist, one term Lead Fire Monitor, and two seasonal crewmembers (Table 1). This crew is responsible for numerous duties ranging from gathering 0800 climatological weather, 1300 fire weather, upkeep of the WIMS and Fire Family plus databases, updating ERC charts, biweekly fuel moisture sampling, and FMH plot work in addition to being redcarded and expected to participate in fire monitoring and suppression activities when needed. The fact that ¾ of the crew was already familiar with Yellowstone nuances and office disarray helped boost productivity greatly. Being able to fund an additional seasonal was instrumental in allowing us to reach goals and accomplish as much as we did. The Fire

Ecologist completed fire assignments as an LTAN in New Mexico, Alaska, Montana, and Yellowstone. The Lead Fire Monitor completed a two-week detail at Everglades NP as a HECM early in the season and assisted in a prescribed fire at Big Horn Canyon NRA. Each crewmember participated in off-park training assignments; one with the Yellowstone Wildland Fire Module and the other with the Park helicopter. Everyone participated in monitoring fires in Yellowstone this year. These assignments allowed the fire monitors to work on taskbooks and earn valuable fire experience.

Table 1. 2009 assignments fire ecology program staffing.

Ecologist and Monitors	Starting & Ending Date	Number of Pay Periods Worked	Number of Pay Periods Funded	READ Qualified (Y or N)	Personal Training and Development
Tonja Opperman Fire Ecologist (GS-11) PFT	01/01/09-12/31/09	26	**26**	No	Northern Rockies Annual Fire Behavior Workshop, Two FPA Workshops, Two WFDSS Workshops, annual training (fire refresher, snowmobile training, first aid training, B-3 Hazmat training), Local Plant Identification, Twitter Tester for NPS, NPS-YELL Compliance Training, Several nation-wide and local LTAN fire assignments.
Jessica Page Lead Fire Monitor (GS-7) TERM	04/02/09-12/18/09	20	15	No	FFI training, S-491, familiarization with WIMS, maintained currency as FWRS, HECM, FFT1, ICT5, FEMO
Matthew Heinz Crewmember (GS-5) Seasonal	05/11/09-10/15/09	11.5	7	No	L-281, S-290, S-211, started FEMO taskbook, finished ICT5/FFT1 and HECM taskbooks, learned more about WIMS, FFI, Excel databases
Morgan Nelson Crewmember (GS-5) Seasonal	06/01/09-10/15/09	10	7	No	Started HECM and FEMO taskbooks. Training assignment with YELL WFM, familiarization with WIMS, Fire Family plus, FFI

PROGRAM NEEDS

Yellowstone is an international icon subject to an unusually high number of interagency and external coordination requirements and limited access for easy fire monitoring. The park is bordered by five national forests in three Forest Service regions, six counties in three states, and another NPS unit. There are numerous border communities as well as in-park communities, and over 100 American Indian tribes who are consulted on many resource management issues, including wildland fire. There are 800 employees spread across seven Ranger Districts that are up to a six-hour drive from Headquarters, 2700 concession employees, and over 2 million annual visitors. The park covers 2.2 million acres with limited access in remote, high-elevation terrain that has many grizzly bears, requiring monitoring staff to travel in pairs for all off-road duties, and sometimes in groups of four. The amount of effort required for this level of coordination and field planning is often underestimated.

History of Fire Ecology Program at Yellowstone

Yellowstone's Fire Ecology Program began in 1997 and was funded for its first Fire Ecologist in 2001. In FY02, the Fire Ecologist supervised four seasonal positions and utilized three additional positions (Prescribed Fire Specialist, Prescribed Fire Technician, and Prescribed Fire Monitor) to achieve program goals. In FY09 the only remaining positions are the Fire Ecologist (26 PP), one Term Lead Fire Monitor (15 PP), and two seasonal monitors (7 PP each). Three of those original positions were cut from the organization chart in 2002 in order to provide upgrades to staff in the suppression program, and one position remains on the organization chart without funding. With a summer workload that includes fire monitoring for wildland fires, fuel sampling, weather station maintenance, weather database management, providing morning fire briefing elements, travel to remote vegetation plots, and maintaining red card qualifications, there is a need for a ***Permanent STF Lead Fire Monitor funded for 20 Pay Periods, a Permanent STF Assistant Lead Fire Monitor funded for 18 Pay Periods, and two seasonal monitors funded for 12 Pay Periods.*** Without a Permanent Lead Monitor, the Fire Ecology Program at Yellowstone is not sustainable. Additional funding for Yellowstone's Fire Ecology Program warrants serious consideration as it fulfills an essential role in providing daily fire intelligence, and provides the scientific basis for both the decision-making on wildland fires and the use of fuel management prescriptions to lessen risk.

Communication and Relationship-Building

The relationship between fire and resource management is complex and enhanced by the size, complexity, politics, and various managers throughout Yellowstone. Relationships between the fire staff and the Yellowstone Center for Resources (YCR), cultural resource staff, compliance staff, comprehensive planning staff, public affairs, interpretation/education, concessionaires, the general public, and long-time park residents require a high level of coordination and communication throughout all phases of project planning and implementation. Much of this coordination and communication is the responsibility of the Fire Ecology Program staff.

The park has been urged by the NPS Intermountain Region (IMR) to establish prescribed fire as a process for fuel reduction to protect assets. IMR does not believe Yellowstone can achieve fuel management goals without a significantly expanded management-ignited fire program. Right now, the program is limited to mechanical fuel reduction and managing wildland fires for resource benefit for several reasons, most of which center around communication and an ability to present Yellowstone-based science to support decisions.

There is a particularly urgent need to increase communications and cooperation between the Wildland Fire Cache operation and the Yellowstone Center for Resources, which oversees all natural resource management in the park except wildland fire. Although the Fire Ecology Program does not have high FMH Plot visits, accomplishments that benefit the overall fire program are not adequately measured solely through FMH plot visitation schedules. In 2009, significant progress was made in establishing positive working relationships with people who oversee wetlands management, migratory bird management, environmental compliance, and GIS databases. For example, our crew completed bird surveys in burned areas this year, worked with wetland survey crews to map wetlands at the Fawn Pass Cabin fuel reduction project, and worked with GIS staff to develop mapping protocols to use during incident management. The Fire Ecology Program will continue as the focal point in forging these relationships in order to benefit Yellowstone's Wildland Fire Program, but more of a fire monitoring presence could be made with a larger staff.

FIRE EFFECTS PLOTS AND DATA

The plot network at Yellowstone is comprised of numerous types that include traditional FMH, Despain-era plots, photo series plots, rapid assessment plots designed to monitor mechanical thinning units, and Fireline Explosive (FLE) plots. This season, the Fire Ecology staff made significant progress in sifting through all of these data to gain a better picture of exactly what types of plots are installed, where they are located, the objectives for their establishment, and the plot visitation schedule. We created a master document listing all plots, locations, comments, status, monitoring type, and other relevant information. There are a few things that should be added to this list such as a link to the protocols used for each plot and which plots had deviations from those protocols, logistics of traveling to these plots with helpful hints on nearby backcountry campsites, how to obtain a backcountry permit, what plans should be made for pack animals or motorboats or canoes, and in which District the plot is located so the District Ranger can be contacted. This document is a work in progress but it at least gives us an idea of our plot work load for the next several seasons. Table 2 is a summary of the types of plots in Yellowstone.

Table 2. Fire Effects Plot Network and 2009 workload.

			Visited in 2009			
Park	**Monitoring Unit**	**Type of Plot (FMH, photo point, other)**	**Pre-burn**	**Immed. Post**	**Postburn (1-20 yrs)**	**Total Plots**
YELL	(Not Specified)	FMH Mechanical				26
	(Not Specified)	FMH WFRB			2	23
	(Not Specified)	FMH PSME				7
	(Not Specified)	FMH BARTR				5
	(Not Specified)	FMH PICO				7
	Norris RX	FMH LP 0			3	4
	Nez Perce thinning	Photo point				13
	(Not Specified)	Despain				14
	(Not Specified)	Photo series				12
	(Not Specified)	FLE				9
	Grant	Mechanical thinning	24			24
Total			**24**		**5**	**144**
			Total Visits in 2009=29; 24 were new installs with pre-treatment data collected			

Norris Prescribed Fire

Three of the FMH-type plots were 01YR02 reads in the Norris prescribed fire. Unfortunately, there were not enough plots established for a statistical analysis but we calculated a 91% reduction in seedlings/saplings less than 2" (5.1cm) which does not meet the objective set forth to limit mortality in this size class to 50% (Table 3). Generally, it appears that seedling regeneration has increased since the last read (Table 4). Herbaceous vegetation is increasing as well with the percent cover of *Carex Geyeri, Epilobium Angustifolium*, and *Arnica Cordifolia* being the most abundant species.

Norris plot three 01YR01 Q4-Q1

Norris plot three 01YR02 Q4-Q1

Matt, Tonja, and FMO Joe Krish getting shuttled by the park maintenance boat to the Promontory for a post-fire plot visit.

Table 3. Management Objectives and Monitoring Results 2009. Fuel reduction objectives/results are mean percent reduction from preburn to immediate postburn. Regeneration objectives/results are for two year postburn mean density.* Too few plots were installed to be statistically significant.

Monitoring Unit	Management Objective	Monitoring Results	Objective Achieved?
Norris Prescribed Burn (LP0)	Reduce 100-hour and 1000-hour fuels to <20 tons/acre immediately post-burn	Pre 100-hour fuel load: 8.0 t/ac Pre 1000-hour fuel load: 41.9 t/ac **Pre Total: 49.9 t/ac** Post 100-hour fuel load: 1.6 t/ac Post 1000-hr fuel load: 21.1 t/ac **Post Total: 22.7 t/ac** *(n=3 plots, 1 fire)**	**No, but close. Mean fuel loading is still above 20 tons/acre.**
	Limit regeneration mortality of <2" trees to <50% 2 years post-burn	Pre Seedling density: 12,626 seedling/ac Pre 1-2" tree density: 189 1-2" trees/ac **Total Live 0-2" density: 12,815 trees/ac** YR01 Seedling density: 459 seedling/ac YR01 1-2" tree density: 114 trees/ac **YR 01 Total live 0-2" density: 573 trees/ac** YR02 Seedling density: 1025 seedlings/ac YR02 1-2" tree density: 108 trees/ac **YR02 Total live 0-2" density: 1133 trees/ac** *(n=3 plots, 1 fire)**	YR01 Total reduction of 0-2" trees is 97%. **No; YR02 Total reduction of 0-2" trees is 91%**

Table 4. Seedling Regeneration at Norris Rx Burn

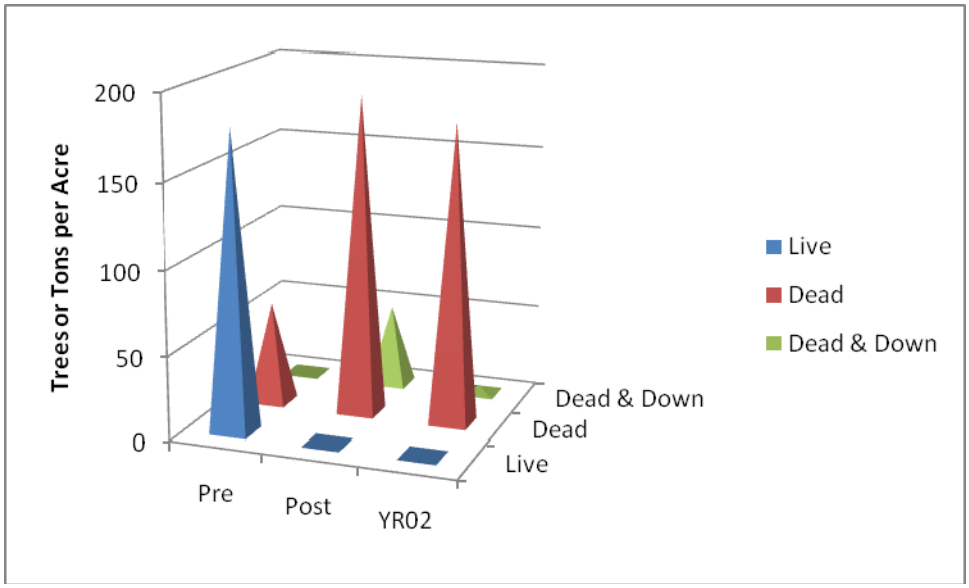
Plot Read	Species	Mean Seedlings/acre
Pre01YR00	Live PINCON	12626
Post01YR01	Live PINCON	459
Re01YR02	Live PINCON	1025

PROMONTORY WFRB

We visited a 01YR02 plot installed in the 2007 Promontory fire located on the south end of Lake Yellowstone. The travel logistics of reading plots at Yellowstone are as diverse as the plots themselves—not only did we hitchhike on the Grant Village NPS maintenance boat to a campsite in the vicinity of our plot, but we also required our own canoes to travel from our campsite to the plot.

Figure 1 is a summary of the live and dead trees on the plot over time. "Dead" trees are those still standing and "dead and down" are trees that are on the ground. Once the trees are counted as dead and down they are no longer counted as trees but should be accounted for in the surface fuels data (Table 5). Unfortunately, we were not able to visit the plot for the 01YR01 read.

Figure 1. Tree fall rate on 1 plot on the Promontory



Tonja and Jess canoeing to a plot on the Promontory.

Table 5. Promontory surface fuels in tons/acre (1 plot).

Monitoring Status	1 HR	10 HR	100 HR	1-100 HR	1000 HR sound	1000 HR Rotten	Total Tons/acre 1-1000HR
Pre0	0.54	0.46	2.78	3.78	36.28	28.57	68.63
Post00	0.03	0.15	0.00	0.18	22.81	9.46	32.45
Re01Year02	0.05	0.46	0.00	0.51	15.98	12.53	29.02

SYLVAN WFRB

This plot was installed in 2003 in the East Fire burn area. It is located upslope from Sylvan Lake on the North side of the road. This plot is in mixed conifer and could be of interest for whitebark pine regeneration. Six years after the fire there is still no regeneration but the herbaceous layer is incredibly diverse. Very few dead trees have fallen to increase surface loads (Figure 2 and Table 6). A wet meadow is just below the plot and some of the species that colonize those areas have moved upslope to the periphery of the plot. Shrub components include *Ribes lacustra* and *Rubus parviflorus*. It appears that in several nearby meadows the fire inhibited conifer encroachment.

Figure 2 Tree fall rate on 1 plot in the East Fire. Trees are 15cm DBH and larger.

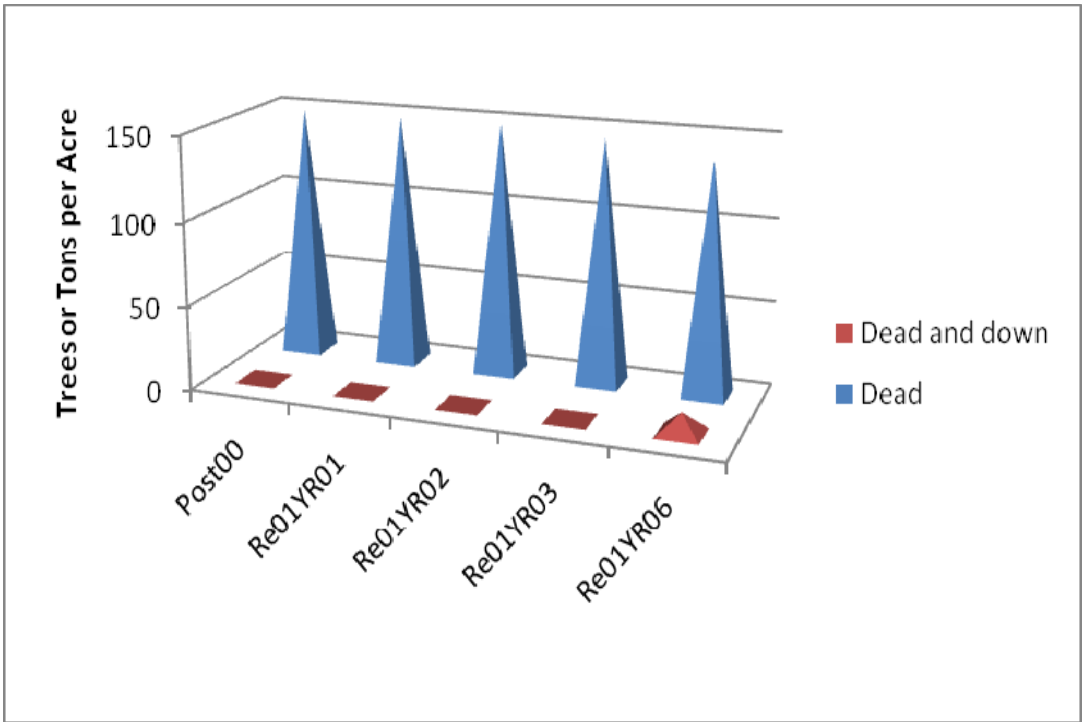


Table 6. Sylvan WFRB 01YR06 surface fuel loading (tons/acre).

Monitoring Status	1 HR	10 HR	100 HR	1-100 HR	1000 HR sound	1000 HR Rotten	Total Tons/acre 1-1000HR	Duff	Litter	Total Fuel loading Tons/acre
Post00	0.00	0.00	0.00		6.93	5.25	12.19	0.12	0.21	12.52
Re01Year01	0.02	0.00	0.00		8.54	4.49	13.04	0.22	0.14	13.40
Re01Year02	0.04	0.16	0.00		7.24	4.54	11.98	0.76	0.19	12.93
Re01Year03	0.02	0.08	0.00		8.27	2.23	10.60	0.05	0.25	10.90
Re01Year06	0.18	1.27	3.73		10.10	0.00	15.28	0.05	0.22	15.55

GRANT MECHANICAL THINNING

We installed 24 plots at Grant Village in the 48 acres of wildland urban interface scheduled for mechanical thinning. The objectives are to create 20-foot crown spacing within 300 feet of all structures, remove pole sized saplings, seedlings, and dead and down woody material within 120' of structures, and remove vegetation that poses a fire hazard from within 30 feet of any structure. Because there were different thinning protocols established for different distances from buildings, we stratified our plots within zones. This resulted in 8 plots in zone 2 (30-120' from structures), 8 plots in zone 3 (120-300') and 8 plots in zone 4 (>300'). No plots were installed in zone 1 (0-30') because it was extremely difficult to locate an area large enough for a plot that didn't overlap a sidewalk, parking lot, or social trail. Protocols were written for surface fuel measurements, herbaceous cover, seedling density and tree density with the expectation that these methods will be standard for all mechanical thinning plots in the future. Only pre-treatment data were collected in 2009 because the thinning is not complete; these data are presented in the following graphs and tables. Table 7 indicates that total mean fuel loading is between 67 and 77 tons/acre depending on zone and mean duff and litter depth is between 1.5 and 2 inches. Tables 8-11 illustrate a high proportion of trees are lodgepole (*Pinus contorta*) in the pole size range (2.5-15.0 cm DBH). This is a relatively young forest with very thick pine regeneration in the stem-exclusion phase.

Table 7. Grant Fuel Loading by Zone in tons/acre; duff and litter measured in inches.

Zone	1 HR	10 HR	100 HR	Total 1 to 100 HR	1000 HR sound	1000 HR Rotten	Total 1 to 1000HR	Duff	Litter	Total Fuel Load	Duff Avg Depth	Litter Avg Depth	Total Depth
Zone 2: 30-120 feet	0.260	1.217	1.968	3.445	24.252	31.044	58.742	9.196	5.509	73.447	0.92	1.10	2.03
Zone 3: 120-300 feet	0.183	0.913	2.726	3.822	33.305	26.002	63.129	8.610	5.359	77.098	0.86	1.07	1.94
Zone 4: >300 feet	0.145	0.875	1.968	2.988	32.130	21.134	56.252	6.801	3.993	67.046	0.68	0.80	1.48

Tables 8, 9, 10, and 11. Pre-treatment Overstory, Pole, Sapling, and Seedling data for Zones 2 and 3 in the Grant Hazard Fuel Reduction project. Plots are dominated by smaller live lodgepole pines.

Overstory

Species	Status	Tree/acre Z2 30-120ft	Tree/acre Z3 120-300ft
ABILAS	L	18	0
	D	0	0
PICENG	L	10	28
	D	0	0
PINCON	L	149	133
	D	13	18
PINFLE	L	8	0
	D	0	0

Pole

Species	Status	Tree/acre Z2 30-120ft	Tree/acre Z3 120-300ft
ABILAS	L	78	14
	D	0	0
PICENG	L	8	181
	D	0	5
PINCON	L	976	1179
	D	23	29
PINFLE	L	35	39
	D	0	0

Sapling

Species	Status	Tree/acre Z2 30-120ft	Tree/acre Z3 120-300ft
ABILAS	L	96	5
	D	0	0
PICENG	L	10	91
	D	0	0
PINCON	L	698	597
	D	18	43
PINFLE	L	23	39
	D	0	3

Seedling

Species	Status	Tree/acre Z2 30-120ft	Tree/acre Z3 120-300ft
ABILAS	L	620	152
	D	0	25
PICENG	L	51	127
	D	0	25
PINCON	L	2567	1480
	D	76	13
PINFLE	L	0	63
	D	0	0

Jess, Matt, and Morgan.

WEATHER AND FUEL SAMPLING DUTIES

Weather-related tasks constitute 20% of our work time. Each day, we are responsible for providing the weather forecast, precipitation, and fuel moisture data at the morning Fire Cache briefing. We maintain all of the manual and RAWS weather stations, the WIMS database, and the National Weather Service climatological database for Mammoth. Our office is responsible for maintaining the Fire Family Plus database and creating the daily ERC chart and Pocket Cards for staff. 2009 began with a dry early spring that turned into a wet cold season that persisted until September. By the end of September our ERC values finally exceeded average and presented an opportunity for several lightning holdovers to move around and require the monitoring skills of our very eager fire effects crew.

WEATHER STATIONS

The Fire Ecology Program maintains five RAWS and five manual weather stations that make up the fire weather network in Yellowstone. For the manual stations this includes maintaining in inventory of weather equipment, initial set-up of the equipment in each station (thermometers, fuel moisture sticks, rain bucket, forms, wind meter) and providing training for our weather observers in the interior of the park. Additionally, the ordering of parts and annual start-up and take-down of the RAWS is our responsibility as well as responding to data issues or equipment breakdowns that occur throughout summer and winter. Response is via helicopter or pack mules due to heavy loads and sensitive instrument transport. ***This year, there were funds available in the suppression budget to offset the cost of necessary helicopter time, otherwise the fire effects budget would have had to pay for it. Paying for RAWS flight time severely limits our budget.***

The Soda Butte RAWS has been in the making for at least five years, and after having parts pilfered, compliance thwarted, and equipment transmission issues, it is finally assembled, transmitting and ready for a helicopter ride to its duty station near the North East entrance. This station will be important in determining fire weather for the Northeast quadrant of the park. We are working on a plan to eventually be rid of manual stations in lieu of an all-RAWS network. RAWS stations with 24-hour wind data are essential for using fire growth and behavior tools available in the Wildland Fire Decision Support System (WFDSS), and at the moment Yellowstone has only four operating RAWS in the very corners of the park and none on the central plateaus.

CLIMATOLOGICAL WEATHER

It is our duty to manually collect 0800 climatological weather at the Mammoth weather station 365 days per year. In the summer we coordinate with other seasonal employees in the Fire Cache, and in winter the Rangers get weather on weekends or holidays. Regardless of who collects the data, we enter all Mammoth 0800 climatological weather into an online electronic database maintained by the National Weather Service (WxCoder). There are six other climatological stations in Yellowstone that send datasheets to us for copying, filing and mailing to interested parties. Although we made progress in 2009 by obtaining the necessary NFDRS components for the National Weather Service's new automated Mammoth weather station, we have so far been unsuccessful in getting the station to transmit data to WIMS due to programming incompatibilities. Automating the Mammoth station for NFDRS purposes continues to be a work in progress. The NWS has asked us to continue with manual 0800 Mammoth observations until they can be certain the automated station is calibrated; however, snow will always need to be measured manually as there is no reliable instrumentation available. The Mammoth weather station has a record of over 100 years and is therefore an important station to scientists studying climate change.

1300 Fire Weather and WIMS

Our crew collects the daily 1300 fire weather at the Mammoth station and input this data plus all observations called in from the other four stations around the park into WIMS and calculated the daily indices. ***This requires at least one of our staff in the office at 1300 to take the weather and input data before 1430 in order to calculate fire danger for the following day.*** Fire Danger and weather information is emailed to park dispatch and the ERC chart is updated. On a biweekly basis the Fire Family Plus database was updated so that a new ERC chart (Figure 3) could be printed. At the end of the season the past year's worth of data was error checked and missing data were entered when possible. Throughout the year periodic quality checks were implemented and recalculations were used when appropriate. We also maintained the station catalogues to make sure the appropriate herbaceous, climate and slope codes were used and updated for green-up or freezing as conditions dictated.

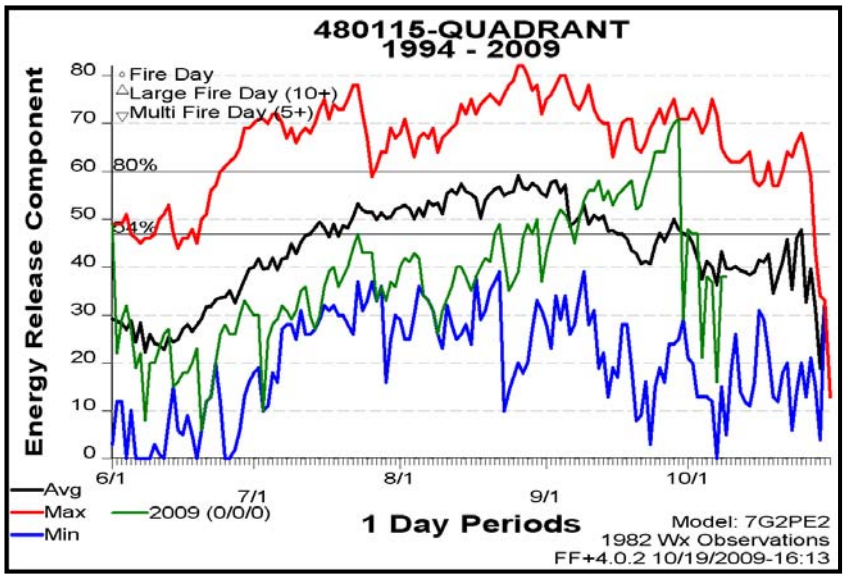


Figure 3. 2009 Yellowstone ERC Chart.

National Fire Danger Rating System (NFDRS)

This year after taking the S-491 Introduction to NFDRS class in Missoula, MT, the Lead fire monitor reviewed all of the Yellowstone Fire Family Plus data for errors and cleaned up the database. These data were analyzed to determine the most representative station for fire business. It was determined that Quadrant RAWS should be used not only because the data correlated well with fire occurrence but it is also a more reliable station than Mammoth since it is automated and collects hourly data rather than just one observation per day. In the past Yellowstone has used only the Mammoth Burn Index (BI) to determine fire business. An analysis determined that the Quadrant ERC was more highly correlated to the park's fire business. This information will be presented to the committee tasked with finalizing the NFDRS operating plan in 2010. Using Fire Family plus and the analysis of weather stations helped us create Yellowstone's 2010 Pocket Card that is distributed to each firefighter, including visiting resources.

Fuel Sampling

We started the season collecting fuel samples from three different sites around the park every other week; however, due to the wet nature of the season, some roads were not passable after just a few weeks. Our sampling was limited to two sites for several weeks until it was necessary to sample near active fires. We identified a third sampling site in the Soda Butte drainage for next year. As indicated by the graphs, early season rainfall delayed the drying of nearly all our fuels size classes. Figure 4 displays 1000-hour fuel moisture results for 2009, but we also sampled live needles, 100-hours, and grasses.

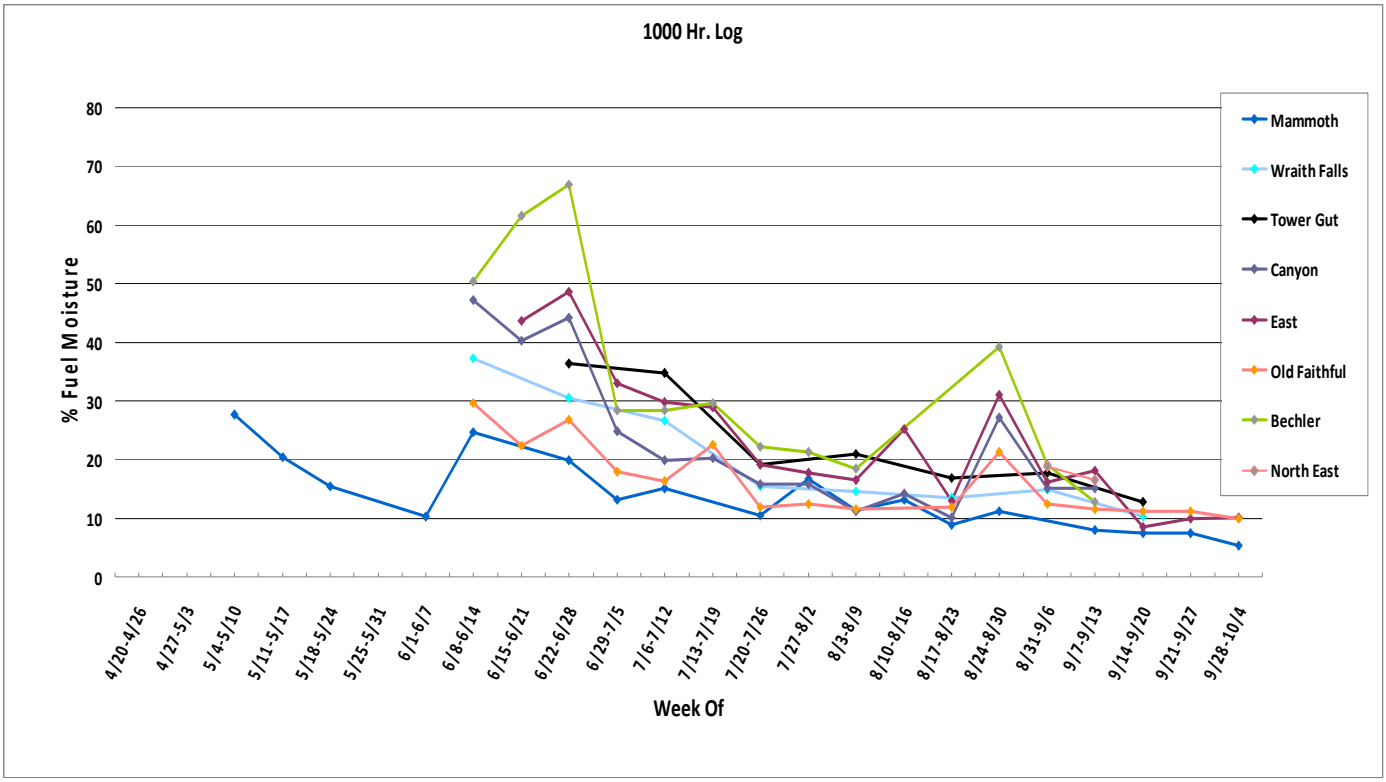


Figure 4. 1000-hour time-lag fuel moistures from various sites throughout the park in 2009.

Morning Briefing Elements and Information Board

The Fire Ecology staff reports the zone weather and current ERC value to fire cache personnel at the daily morning fire briefings during the fire season. We also check station data in the morning to report precipitation amounts and patterns. These data are posted to an information board that we maintain with weather, precipitation, fuel moisture, snowpack, and long-term seasonal outlook data. Our staff provides a monthly fire outlook report to the Superintendent's office to keep them informed on potential fire behavior in the park throughout the season.

The Arnica fire grew to over 10,000 acres late in September and impacted visitor services throughout the park when roads were closed and smoke settled overnight near Lake Village.

2009 STAFF ACCOMPLISHMENTS AND AREAS OF FOCUS

Table 12. Fire Ecologist Accomplishments/Focus Areas

Category	Percent Time	Accomplishments and/or areas of activities
Planning	10%	• Attended several in-park meetings to discuss fuels program at Canyon, Grant Village. • Participated on Yellowstone's Comprehensive Planning ID Team for planning at Roosevelt-Tower and Lake developed areas. • Spent 5 days in backcountry to assess wetlands
Presentations	<5%	• Northern Rockies Fire Behavior Workshop • Superintendent/Squad re: Fire Fuels IDT
NPS Meetings/ task groups	8%	• Member, Yellowstone Fire and Fuels ID Team • Participated in Goals and Objectives meetings for Fire Management staff at Yellowstone. • Staff Meetings and Daily Fire Briefings (summer only)
Interagency work	15%	• FPA Workshops and meetings • Co-Lead Instructor for S-495, Geospatial Fire Analysis, Interpretation, and Application (new course with 100 hours of online instruction and 40 hours residential training).
Fire Assignments	15%	• LTAN on several fires in the Park and off-park
Research	5%	• Working with Colorado State as Starfire prototype park.
Data entry	<5%	• Monitors completed most data entry.
Data Collection	10%	• Visited plots at Promontory and Grant Village • Helped botanists with wetlands inventory at Fawn Pass • Completed bird surveys in LeHardy burned area
Data analysis	<5%	• Lead Fire Monitor completed most data analysis
Supervision/Admin	10%	• Ordered new furniture and computers • Hired Seasonal Monitors • Prepared materials for seasonal announcement • Completed/Administered travel, payroll, and credit card statements.
Training	8%	• Compliance training, Yellowstone NP • Fire Refresher, Snowmobile, and First Aid, Yellowstone NP • Aviation Safety Class (B3), Yellowstone, NP • Attended Northern Rockies Fire Behavior workshop
Miscellaneous	10%	• Annual, Sick and Administrative Leave and Holidays.. • Record and enter 0800 & 1300-hour weather data, troubleshoot manual winter stations. • Physical Training

Table 13. Fire Effects Crew Accomplishments/Focus Areas (28 weeks of work for Lead).

Category	Percent Time	Notes
FMH plots	5%	• Norris Rx 2yr post reads • Sylvan pass • Promontory
WUI plots	5%	• Grant Village installs
CBI plots	0%	
Other plot work	0%	
Fire Assignments	20%	• Lead assisted on one RX burn as FFT1 • Lead went on 2 week severity assignment as HECM • Crew member detailed with the YNP Fire Use Module for two weeks. • Crew member staffed Park helicopter on 2 week out of park assignment. • Crew provided ICT5, FFT1, FEMO, and HECM support for 11 fires in YNP
Fuels work	5%	• Crew collected and processed fuel moisture samples bi-weekly
Data entry	6%	• Input data for 99% of 2009 data and began entering Daubenmire data from previous years. This includes quality checks too.
Data analysis	2%	• Ran analysis on Grant and Norris plots, learning the nuances of how to get data out.
Supervision/Admin	5%	• Lead monitor supervised two crewmember, • Miscellaneous travel and time, and credit card paperwork
Training	10%	• Each crew member had refresher training and miscellaneous administrative training • One crewmember took S-211, S290, L280 • One crewmember • Lead took Rx-310 and Wilderness first responder
Weather	20%	• Maintained 4 RAWS stations, 5 manual • Trained volunteers and cache personnel in protocols for taking afternoon fire weather • Input weather information into WIMS and weather coder daily • Administered WIMS station catalogues and updated ERC charts as needed. • Rewrite RAWS manuals • Create annual weather recording logbook
Office/Miscellaneous	20%	• Completed yearly inventory of fire effects equipment (and fire cache wide inv); purchased new gear; reorganized office, lab, and storage space; janitorial duties of fire cache; search and rescue functions; rewrite fuel moisture database, plot data sheets

CHALLENGES AND SOLUTIONS

- Challenge: The Lead Fire Monitor is a Term employee not to exceed four years. Solution: We would greatly benefit from a permanent subject-to-furlough position; this needs to be pursued in FY10.

- Challenge: The Fire Ecology Program must increase efforts to work with resource managers at the YCR in order to fully understand concerns and constraints regarding the fire management program. Solution: We have helped conduct bird and wetland surveys to foster better communication, thus building positive working relationships and we will continue these efforts.

- Challenge: Visalia is not making or servicing parts for our RAWS after 2011 and we're unsure how long the Depot can supply parts. Potential Solution: migrate to FTS-type stations after securing funding.

- Challenge: Requirement to collect 1300 weather data and enter in WIMS prevents sending a full crew to field and hampers data collection. Until the Mammoth station is automated to communicate with WIMS, this is a necessary task. Solution: We utilized fire dispatch and other cache personnel to collect and enter data. We are continuing our partnership with the Riverton NWS office and the Boise RAWS Depot to solve the communication/programming errors.

- Challenge: Of the 11 FMH plots scheduled to be read next year, 9 are cross-country hikes of 4-9 miles each way through downed lodgepole in grizzly country. They were installed in front of active fires that allowed use of the Park helicopter at no cost to our monitoring budget. Potential Solution: We will need to either obtain funds for this mode of transportation or come up with an alternative method. We are not averse to hiking or using pack mules but it does require at least twice the time commitment and significantly more preparation time including 5-day horse training for all crewmembers.

- Challenge: The manual stations do not provide the type of data needed for the Fire Spread Probability model in WFDSS. Demand from decision-makers for FSPro products will increase, and yet we are forced to use weather stations that are outside of the park and over 50 miles away. This compromises our ability to fully utilize the capability of WFDSS. Potential Solution: We must pursue a fully-functional RAWS network at Yellowstone—especially for the Central and Mirror Plateau areas. At this time, it appears there are several roadblocks to making that occur, including funding and wireless compliance.

- Challenge: Fuels management at Yellowstone is contentious. Although there is agreement that some fuel reduction is necessary to protect values at risk, there is disagreement in how to prioritize fuels projects, the size of treatments, how to find the time and money to accomplish necessary compliance, and in what way to manipulate fuels. Potential Solutions: We have been working on parameterizing the Starfire model to aid in prioritization efforts. Our Fire and Fuels ID Team is working on finding agreement by establishing criteria for the prioritization process.

CONCLUSION

Yellowstone's Fire Ecology Program is still relatively young and there are several challenges that require attention. It is unlikely that Yellowstone will ever have the plot workload of a park with a large prescribed fire program, but that does not diminish its need for a robust fire ecology presence in a park that manages several uncontrolled fires each summer and completes fuel reduction projects where high values at risk occur. We will continue to increase communication with other park staff and to work side-by-side with them on projects in order to demonstrate the our commitment to science-based resource management.