National Park Service
Fire Ecology Annual Report
Calendar Year 2004
Yellowstone National Park

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Summary

Yellowstone's Fire Effects Monitors continued on a variety of projects in 2004. No base funded seasonal Fire Effects Monitor positions were provided so that adequate staffing was an issue this year. One Fire Effects Monitor position was created from other sources. Our approach was to cover our tasks from the ground up, providing for Level 1 and 2 tasks (Short term weather and fire behavior monitoring) to allow for fire-use fires before Level 3 and 4 tasks (Long term vegetation and fuels monitoring).

Level 1 and 2 priorities were:
- Record daily climatological weather,
- Maintain RAWS and manual weather stations
- Provide daily weather, fire danger indices, and lightning information to Fire Management staff.
- Monitor fire-use fires (Four fire-use fires were monitored and supported).
- Summarize and file monthly climatological weather with Farnes (USGS).
- Provide weekly fire weather summaries to the Chief Ranger, Sub-District Rangers, and the Fire Management Staff.

Level 3 and 4 priorities were to:

- Monitor new and on-going hazard fuel reduction projects. Plots were installed in the West Entrance, South Entrance, and Canyon front-country hazard fuel reduction projects. Two of the three 2003 WUI projects were re-read (East and Northeast). We were unable to re-read the 2003 Lake WUI project plots. Staffing levels made installations and re-reads of back-country cabin

WUI projects (although popular and pleasant overnight assignments) uneconomical. Harebell and Buffalo Plateau cabin projects were not re-read.

• Monitor fire-use opportunities in whitebark pine or Douglas-fir forests. Two fire-use plots were installed on the Broken Ankle and Promontory fire-use fires. Neither burned.

• Read CBI plots on the 2003 East and Grizzly Fires.

Other projects

The Fire Monitors hosted the University of Idaho's Upward Bound High School Field Camp. The students assisted in sampling fuel loading in andesitic forests of northern Yellowstone. Twelve photoseries plots were sampled over 4 weeks and will be used to create custom surface and canopy fuel models. Our continued cooperation and collaboration in 2005 is dependent on staffing levels.

Four permanent fire weather 1000-hour log stations were established in 2003 to monitor fuel moisture over the winter to address the question of how deficits in heavy fuels carries over from one season to the next. The stations represent the gradient from high elevation forest (Osprey Falls) to lower timberline (YCC camp, Mammoth) to low elevation, valley bottom sagebrush (Rescue Creek). These stations will be monitored through the winter of 2004-05.

We produced the fourth annual Fire Effects Newsletter, *Rx Effects* in June (www.nps.gov/yell/technical/fire/effects.htm).

McEldery was requested by the NWCG to review the FEMO task book.

Miller presented a program to the Montana Youth Conservation Corps in June.

Miller was an organizer and participant in the "Statistical Foundations for FEAT" course in Fort Collins, Colorado in May. The course was attended by McEldery, Seifert, and Moss.

Miller is part of the FEAT Conversion Working Group. This group is a liason between Spatial Dynamics (the software developers) and the NPS.

Table 1. Fire Effects Plot Workload 2003

Park	Monitoring Unit	Type of Plot (FMH, photo point, other – describe)	Pre-burn	Immed. Post	Postburn (1-20 yrs)	Total Plot Reads
YELL	Mechanical Hazard Fuel Reduction	Custom	16	23	0	39
YELL	CBI	CBI			18	18
YELL	WFURB-FMH	FMH	2	2	8	12
YELL	WFURB-Despain	Custom	0	0	0	0
YELL	Andesitic Forest Fuel Modelling and Photoseries	Custom	12		0	12
Total			**30**	**25**	**26**	**81**

Table 2. Fire Ecology Staffing2003

Monitor	Starting Date	Ending Date	# of Pay Periods	Training and Development
Becky Seifert, Fire Effects Monitor	5/16/04	10/01/03	10	S-130/190 (Instructor, 6/04), Statistical Foundations for FEAT (6/04), Teton Interagency Fire Effects Meeting (2/03)
Emily Moss, Fire Effects Monitor	5/16/04	10/01/04	10	RX-310, S-290, S-130/190 (Instructor, 6/04), Statistical Foundations for FEAT (6/04), FEMO (10/04)
Shawn Jackson, Fire Monitor	5/30/04	10/01/04	9	S-130/190 (Instructor, 6/04), EMT training, First Responder (9/04)
Sean McEldery, Lead Fire Monitor	2/9/04	12/31/04	21	S-130/190 (Instructor, 6/04), Statistical Foundations for FEAT (6/04), Review of FEMO taskbook, S-490 Advanced Fire Behavior Calculations, S-493 FARSITE
Eric Miller, Fire Ecologist	12/28/03	1/1/05	26	Teton Interagency Fire Effects Meeting (2/03), 130/190 (Instructor, 6/04), Statistical Foundatio for FEAT (course organizer & participant, 6/04 Tucson FRCC Workshop, (11/03).

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Table 3. Management Objectives and Monitoring Results 2003

Monitoring Unit	Management Objective (Restoration)	Monitoring Results (XX% confidence interval)	Objective Achieved?
Mechanical Hazard Fuel Reduction	Immediately post-treatment canopy bulk density <56 g/m^3 (80% confidence and 20% precision	Final CBD = 41.3 g/m^3 *(2003, n=9 plots, 3 treatment units)*	**YES**

Sampling Design and Field Methods

Changes in Protocols

In 2003 we collaborated with GRTE in implementing a new monitoring type and method for mechanical hazard fuel reduction projects. The protocols address canopy bulk density, ladder fuels, surface fuels, and esthetics. The plots are relatively small so that many of them can be placed in the project area to fully represent the treatment. Canopy specifications in the Hazard Fuel Reduction Plan call for an average crown spacing >20'. Crown spacing is not easily measured and is not currently used in crown fire models which use canopy bulk density (CBD). Therefore, we chose to declare our management objective in terms of CBD <56 g/m^3. Several parameters for each tree are fed into the Crown Mass module of Fuels Management Analyst which outputs an estimate of canopy bulk density. The canopy fuel plot size increased from 4 m

in the pilot plots to 7 m radius overall. Ladder fuels were initially sampled in 2003 using a very efficient sightability index but we felt that the information, as sampled, was not as useful as stem counts in size classes. A 2 m radius sapling/seedling subplot was used in 2004. Brown's transects are standard, 15 m long.

Status of Planning Documents

Miller is working on the Fire Effects Monitoring Plan which is partially complete and needs to be updated to reflect the Ten Year Hazard Fuel Reduction Plan.

Yellowstone's Hazard Fuel Reduction Plan as an addendum to the overall Fire Management Plan was completed in 2003.

Julie York is updating the Fire Management Plan.

Monitoring Results

Completed Reports

See the attached CD: Miller, E.A., R.J. Seifert, S.A. Weyenberg, S.C. McEldery, A.C. Oestreich, S.J. Jackson, E.R. Moss, V.A. Pecha, R.A. Renkin, and Steve Petrick-Underwood. 2004. *A Fuel Appraisal Photoseries for Early Post-fire Lodgepole Pine Forests in Yellowstone National Park.* A report to the Fire Management Office,Yellowstone National Park, P.O. Box 168 Yellowstone National Park, WY 82190-0168.

See attached CD: Miller, E.A., R.J. Seifert, E.R. Moss, S.C. McEldery. 2004. *A Photoseries for Estimating Bulk Density of Logs in Yellowstone National Park.* A report to the Fire Management Office,Yellowstone National Park, P.O. Box 168 Yellowstone National Park, WY 82190-0168.

In Progress:

Miller, E.A., R.J. Seifert, & E.R. Moss. *An Estimate of the Threshold Canopy Bulk Density to Sustain Crown Fire in Lodgepole Pine Forests.* A report to the Fire Management Office,Yellowstone National Park, P.O. Box 168 Yellowstone National Park, WY 82190-0168.

Miller, E.A., R.J. Seifert, E.R. Moss, S.C. McEldery, S.J. Jackson, A.C. Oestreich, and D.G. Despain. *Seasonal Foliar Moisture Trends in Post-fire Lodgepole Pine Forests in Yellowstone National Park.* A report to the Fire Management Office,Yellowstone National Park, P.O. Box 168 Yellowstone National Park, WY 82190-0168.

Miller, E.A., and S.C. McEldery. *Methods and Rationale for Monitoring Fuel Moisture in Western Conifer Forests.*

Research Projects/Collaboration

We are collaborating with Don Despain on a forest-meadow ecotone project. Despain's project addresses the question of why forest-meadow boundaries resume their former positions following fire. Despain has installed data loggers to monitor seasonal trends in soil moisture while the Fire

Effects Monitors are providing the above-ground foliar, herbaceous, and log moisture information. This project will contribute to our knowledge of water usage by trees and meadow vegetation, how the forest-meadow mosaic is maintained by edaphic properties (e.g., soil moisture, composition, or chemistry) rather than by fire, and indicate how drought may be carried over in heavy fuel and soil moisture reservoirs from one year to the next.

We collaborated with the University of Idaho's Upward Bound High School Field Camp Program on our andesitic forest custom fuel model and photoseries project. We provided a project suitable for their program in return for student labor. Students provided about 770 hours of labor on this project. The students solved real-life, mathematical problems to arrive at usable solutions, specifically fuel loading.

Adaptive Management

A preliminary LP0 fuel model was provided to the LTANs that detailed to Yellowstone during our exceptional 2003 fire season. This documentation empirically debunks the perception that Yellowstone fuels will not burn following the extensive fires of 1988. It allows the Fire Management Office to better predict fire behavior in the LP0 cover type.

We provided an informal presentation to Fire Management Office and Yellowstone Center for Resources staff in November. We covered our canopy bulk density findings, trends in fire weather and fuel moistures, and the custom LP0 fuel model. These topics were also presented at the GRTE-Bridger Teton N.F. fire effects conference in Jackson in February. The topics of concern that were brought up centered not on management objectives of fuel reduction (although confirming our objectives) but rather on the esthetics of mechanically removing fuels.

Publications

See Monitoring Results.