



Fire Ecology Program 2004 Annual Monitoring Report Yosemite National Park

Introduction

The 2004 season for the Yosemite Fire Ecology program was characterized by many challenges including vacant positions, odd weather and policy constraints. It was an average year for acres treated in Yosemite with 365 acres of prescribed burns, 350 acres of mechanical treatments, 5633 acres burned in 7 WFU (Wildland Fire Use) and 2300 acres in human caused Wildland Fire. Though fewer acres were treated than in more recent years, the amount of work required to monitor the effects of these various treatments remains enormously challenging. With the dedication and skill of the 2004 Yosemite Fire Ecology staff, nearly all planned plot rereads and installations were completed.

The effects of fire and thinning were monitored according to 8 different protocols in 9 different vegetation types. Thirty three FMH plots, 63 Rapid Assessment plots, 64 Retro plots, 58 CBI burn severity plots, 30 “Jan’s plots”, 28 Sugar Pine Mortality plots, 15 Sugar Pine trees affected by fire retardant and 4 (each includes 20 subplots) 1911 transects were installed or reread for a total of 280 plot reads (excluding the sugar pine retardant trees).

A huge challenge of the 2004 season was compensating for the high turnover in key positions in the Fuels and Ecology office. Dan Buckley, Prescribed Fire Manager, left Yosemite for a job with the National Interagency Fire Center in late November of 2003. After a 120 day detail in the position, Michael Beasley, Prescribed Fire Specialist in Yosemite, accepted the job in early April leaving his job vacant. Taro Pusina, the lead of the Crew 6 Wildland Fire Use crew, detailed into the Prescribed Fire Specialist position while Brandon Dethlefs from the Whiskeytown Module detailed into the Lead position for 120 days until he was officially hired as the assistant for that crew. Kara Paintner, fire ecologist, and Mark Grupe, Fire GIS specialist,

left in late June leaving 2 more positions vacant. Jen Hooke came in late July for a 120 day detail in the fire ecologist position and Kent Van Wagtendonk detailed into the fire GIS position for 120 days before accepting the position in mid December. Taro Pusina accepted the Prescribed Fire Specialist job in December leaving the Crew 6 lead position vacant and there are no plans to hire the Crew 6 lead position in time for next season. There was even some turnover in the seasonal fire effects staff with Elizabeth Ayres leaving after only 2 months and being replaced by Colleen Ross shortly after. With the new faces and shifting positions workloads were greatly increased and nearly all staff members were asked to work above and beyond their PD (position descriptions). The Fire Ecology program did gain a position and Ilana Abrahamson, a seasonal on the fire effects crew was hired as a term GS-06 fire effects crew assistant lead in late November 2004. See Table 2 for the Fire Ecology branch staffing.

Another new addition to the program is FEAT (Fire Ecology Assessment Tool) a new National Park Service database that will replace the current Fire Monitoring Handbook (FMH) database that still is in a DOS interface. While the new database will make data management, accessibility and analysis much improved the database is still undergoing beta testing. The crew spent most of the office time trying to enter data into FEAT, documenting problems and posting these issues on a forum. The new database is compatible with PDA's for field data entry and crewmembers spent hours working with them and documenting problems. These suggestions will be taken into consideration as the database is further developed and refined. There is progress being made on the conversion program that will transfer the data in the FMH database into FEAT. When the FEAT database is completely up and running, it will allow for all of the fire effects data, regardless of protocol, to be in one database leading to better organization and documentation.

With all of these challenges, the fire effects crew worked non stop to complete the huge workload. An early snowfall prevented completion of some fieldwork which will be added to next years' workload. Due to extremely dry conditions and air quality issues, there was less fire activity in Yosemite than usual and so crewmembers spent less time on fires than in past seasons but still contributed greatly to each WFU and prescribed fire projects. They acted as READ, FEMO, FFT2, helitack, ignition and holding. The huge variety of protocols and unpredictable nature of fire requires that the Fire Ecology staff must be flexible and compromising, a task that they all take in stride.

SUMMARY OF PLOT WORK

Described below are the 8 different monitoring protocols implemented in Yosemite in the 2004 season. Included in the summary are work completed in 2004, issues and concerns and future plans. See Appendix D for location of plots by burn unit. See Table 1 for a summary of all plots currently active in the program.

FIRE MONITORING HANDBOOK (FMH)

FMH plots are 20 x 50 meter plots installed according to the protocol outlined in the National Park Service Fire Monitoring Handbook (Fire Monitoring Handbook 2003). Data is recorded for dead and down fuels, trees, seedlings, saplings, herbaceous, shrubs and photos are taken. Thirty FMH plots were reread and 3 were read immediate postburn in 6 different vegetation types. In an effort to continually increase quality and repeatability of the plots, each plot reread and installed has completed plant lists, tree maps, seedling maps, organized plot folders with photos included, a photocopy of the entire plot folder, all brass tags instead of aluminum tags, painted rebar where appropriate and completed plot maintenance. All FMH plots have been GPS'd and have been added to the GIS database as a data layer available on the GIS server, ms6\gisdata\fire\fmh.

Three FMH plots were burned in a second entry burn in Mariposa Grove. Earlier in the season, these plots were reread for YR15 and again immediately postburn. Due to the condition of the databases, no analysis was done on these plots

A total of 114 FMH plots have been installed in Yosemite National Park since 1988. Six have been removed due to visitor disturbance, restoration activities in meadows and/or thinning. Nine plots were installed after the A-rock (Ackerson) fire in 1990 and were managed by the division of Resource Management and Science until 2004 and now will be managed with the rest of our FMH plots. According to the 1996 annual report, 18 plots were given to Resource Management to monitor as "control" plots. The raw data for these plots was missing for several years but was finally relocated in 2001. None of the plots had been read since 1996 and since, 7 have been relocated and reread, 1 plot was searched for and not relocated, and 3 plots located in Yosemite Valley were found but the human and flooding impacts are too great for the data to be useful. Two more plots were relocated but not reread and attempts to field locate the other 5 plots will occur next season if time allows. These 7 plots as well as 5 of those reread in 2002 and 2003 are not located in burn units scheduled to burn within the next few years so may be used as control plots to examine long term fuel accumulation and tree mortality without fire. There have been 21 plots installed in Yosemite Valley meadows since 1989 but they are not

effectively monitoring the resource and fire management objectives for prescribed burns. Four of the plots have already been removed due to restoration activities and the others have been retired from the program because of relatively useless data, very poor data quality (questionable plant ID, lack of documentation of unknown plants, and rereading the plots when plants are dormant) and human impacts.

Data entry for the 2004 season has been very slow and challenging. Learning the intricacies of the FEAT (Fire Ecology Assessment Tool) database has been slow and tedious. The database is still in the “editing” phase and staff using the program is providing feedback for improvements and the next version, incorporating many of these suggestions, will be available in March. Network access is not always reliable in the park and is a limiting factor in getting data entry completed so after many emails and phone calls, Jen Hooke was finally able to get a local logon for crewmembers so data can be entered even when the network is down. Contractors are currently working on the conversion of FMH data into FEAT and will be released some time in March. Data analysis will be very limited until this conversion is complete and many of the problems in FEAT are remedied. There was an absence of quality checking the data entered into FMH prior to 2000 so even after the conversion is complete, significant error checking will be needed to ensure data quality for the older data. All of the FMH data was entered into FEAT, some of the rapid assessment and a little of retro plots.

FMH plot installation will continue in FABMA1T08 (Red fir) and FPIPO1T09 (Ponderosa pine mixed conifer) monitoring types to reach minimum plot numbers. Minimum plot numbers for the FSEGI1T08 type may not be achieved due to the small size of the sequoia groves. The monitoring type is very similar to Sequoia and Kings Canyon giant sequoia plots so potential exists to combine datasets for comparison and data analysis. Plots in the other vegetation types may be installed in areas that are proposed for burns if appropriate. For more information on the FEAT database or for downloads, see: <http://forum.spatialdynamics.com>

“RETRO”

Over 300 permanent circular fire effects plots, the standard sampling method in Yosemite National Park prior to the implementation of Fire Monitoring Handbook (FMH) protocols, were installed throughout the park in the late seventies and early eighties. All of these plots were retired from the program in the late eighties and early nineties when FMH became the standard protocol. Retro plots are set up on parallel transects at equal distances apart throughout the burn unit. Each plot has 2 pieces of rebar, measures trees in a variable plots radius with a BAF(Basal Area Factor) prism, has one fuel transect, measures vegetation

using modified Daubenmire quadrats, and measures seedlings and saplings in a millhectare circle. In 1999, the data was assessed and some plots were reread to verify the data quality and usefulness of the plots. Since the plots monitor the similar components as an FMH style plot and some plots were installed as early as 1978, providing data through as many as 3 burns, the data is invaluable. The plots are referred to as “Retro” plots to distinguish them from FMH plots. When the plots are reread, photos are taken and some additional data is collected on trees to make the data more compatible with the FMH protocols.

Twenty eight plots in Yosemite Valley that were relocated and reread in 2001 burned in 2003, were reread immediately postburn and again this summer, 1 year after the fire. Eight retro plots located in Mariposa Grove were reread in 2002, immediately postburn in 2003 and 1 year after the fire in 2004. Twenty plots reread in 2001 were burned in spring in the Big Creek burn and reread immediately postburn.

There are still at least another 50 plots not reread or relocated that are in burn units and 100 that are not in burn units. Efforts will continue to relocate and reread retro plots but missing data, inadequate maps and missing rebar are major obstacles for some of the remaining plots. Additionally, the plot design allows for a lack of independence among sampling units with regard to overstory trees. Some of the plots are arranged along transects with minimal spacing between plots the variable plots radius method allows some trees occur in more than one plot.

While retro plots were still active in the program, some of the data was entered into dbase, a DOS based computer program. A small amount of the data is stored on 5-1/2 floppy discs but most of the data cannot be relocated. One computer does remain in the Fuels and Ecology office that is old enough to read these discs so that the data can be stored on a hard drive. Jen Hooke developed a “cheat sheet” to enter this data into FEAT so data entry for these plots can begin next season.

RAPID ASSESSMENT

To better monitor the effects of mechanical thinning and Wildland Fire Use fire, protocol has been developing since 2002 for a “rapid assessment” plot. A protocol was needed to monitor treatments in areas that large plots with a lot of rebar are not feasible and when time is an issue. Contractors finish projects under strict time constraints and fire behavior of WFU fires may restrict the amount of time available for plot installation. There is also a need to answer management question and determine whether management objectives are met in a timely and statistically valid method.

Each rapid assessment plot takes an average of 1-½ hours for two people to install and reread, making it possible to install many plots over the project area in relatively little time when compared to FMH. With a higher number of plots, minimum plot numbers are achieved more quickly and inferences about the data can be made with more confidence.

Some of the data collected since 2002 has been used in CrownMassTM, a program that models the probability of crown fire based on ladder fuels, height to live crown, canopy cover, percentage of live crown and fuel load. This modeling may help determine if current methods of mechanical thinning are sufficient for reducing the threat of crown fire. This data was presented in a poster in 2003 and is available in the Fuels and Ecology office.

Some data has been entered into Excel spreadsheets and FMAPlus (Fuels Management Analyst) for basic analysis but is now being entered into FEAT. Jen Hooke created a “cheat sheet” on how to enter the data into FEAT and much of the 2004 season data was entered. Data entry for trees still remains a problem as FEAT is spatially based and the variable plots radius makes data entry complicated. The next version will detach the spatial functions of FEAT from the main database so data entry will be postponed until that is available.

Mechanical Thinning:

The rapid assessment method is suited for mechanically-thinned areas because the 100m buffer around homes and the 60m buffer from road edges makes installing FMH plots to be feasible due to the many of pieces of rebar, size of the plot and the time commitment per plot. For most projects, the mechanical thinning objective is to reduce trees < 6 inches DBH (diameter at breast height) by 75-80% and piling them along with dead and down fuels. The piles are burned in the fall through spring when fire danger and spread potential are relatively low.

Pilot sampling began in 2002 with the installation of 20 rapid assessment plots in the 40 acre Yosemite West WUII area. In this project area, an ATV with a fetching arch was used to remove large logs out of the area. In each plot, data is recorded for dead and down fuels, overstory trees (including total height and height to live crown), seedlings and saplings, exotic plants, soil disturbance, canopy cover, shrub cover and photos. After mechanical thinning was completed in mid October, the plots were reread. On those plots with piles located on the Brown's line, fuels were not reread until after the piles were burned over the winter. 18 of the 20 plots were reread in the fall of 2003 as an YR01 read. Two plots were not reread because piles had not been burned in that area. None of the plots were reread this season due to the early snow and huge workload. Time permitting, the plots will be reread next season. Preliminary

results from these plots were presented in a poster at the 2003 Fire Ecology Conference in Orlando. The poster is available at the Fuels and Ecology office.

An extensive mechanical thinning project was initiated in June 2003 along the Big Oak Flat road. (HWY 120). Seven miles on both sides of the road were treated using only hand thinning by a contract crew, Redding Tree Growers. Treatment extended 200 feet (~ 60m) from the centerline on both sides of the road. Excluding sugar pine and hardwoods, 75% of trees < 6" DBH were cut, limbed and piled. Some large logs were bucked and piled but none were removed from the area and low hanging branches were cut to increase height to live crown. Seventeen rapid assessment plots were installed along the road at least 66 feet (20m) from the edge of the road to minimize the road impact. Plots were located using stratified random placement along an X and Y axis. More plots were going to be installed but the contract crew did not complete the project in the order that was planned and areas were thinned before more plots could be installed. All of the piles were burned in November and December of 2003 and the plots were reread in 2004. Only 1 of the 17 plots installed was not thinned. The high concentration and dry burning conditions of the piles caused scorch on many trees along the roadside. As a request from the superintendent, several of the scorched trees were removed in early summer for aesthetic reasons. This will be taken into consideration when determining the results of the initial treatment.

The area around Hodgdon Campground and housing area was also mechanically thinned and 11 rapid assessment plots were installed in the 100m buffer in 2003. Mechanical thinning was completed by CCC crews, with only chainsaws, following the same prescription as the Big Oak Flat road project. All piles were burned in November of 2003 and the plots were in 2004. All plots had been thinned.

The new Fire Management Plan authorizes thinning trees up to 20" DBH in WUII areas. The enormous number of piles and resulting scorch encourages the use of chipping to remove some of the biomass from the area rather than burning it. A project was planned to apply this prescription along portions of HWY 41 and 120. Only areas accessible from long pullouts where a chipper and machinery to extract the larger trees could park would be affected. Larger trees are pulled out with a felling arch or platform to avoid skidding and ground disturbance. Smaller trees are chipped and hauled to a CoGen plant in China Camp. The project was not implemented until late fall due to contracting issues and the high costs per acre. Portions of Hwy 120 have been treated and work on 41 will continue through the winter, weather permitting. Seven rapid assessment plots were installed next to large pullouts along a 145 acre, 3.5 mile stretch on the Big Oak Flat Road and 7 were installed along a 180 acre, 4.5 miles stretch on

Highway 41. Once the treatment has been implemented the plots will be reread to assess the effects of this more aggressive treatment.

Wildland Fire Use (WFU):

Little to no preburn vegetation or fuels monitoring has occurred on WFU fires in Yosemite. Knowledge of the effects of these fires is important ecologically as well as for air quality and other management issues. In 2003, 22 rapid assessment plots were installed in 2 active WFU fires. The same components were measured as in the plots installed in mechanical thinning areas with protocols adjusted slightly to better measure objectives. The plots were read immediately post burn in 2003 and again YR01 in 2004. This data along with onsite fire and weather records can be used to better refine prescriptions for prescribed fire as well as helping to answer questions about the effects of fires burning with little human interference in vegetation types with limited knowledge of fire history, current conditions, and effects on vegetation. The plot data has already been useful for estimating smoke emissions for the air quality districts based on fuel loading and overstory tree composition.

No rapid assessment plots were installed in WFU fires this season due to fire behavior and management actions. WFU Plot data from 2003 was used by the WFU team managing the Meadow WFU to calibrate the overstory and fuels data for fire behavior prediction models FARSITE (Fire Area Simulator) and RERAP (Rare Event Risk Assessment Process). Refer to the FIRE section of this report for a summary of the Meadow WFU.

Future plans:

With the implementation of the Bush Administration's Healthy Forests Restoration Act, there has been an increase in the number of acres mechanically treated. Phase I of the treatments, heavy thinning in a 100 meter perimeter around homes and other facilities was completed in some areas of the park this year as well as some roadside projects. More rapid assessment plots will be installed in 2005 project areas. If thinning projects enter into Phase II and III, thinning farther away from homes, FMH style plots may be installed in conjunction with the rapid assessment plots where feasible to better validate the data.

The development of the rapid assessment plot is still a work in progress. Based on the response and interest from other National Parks and neighboring National Forests, the need for this type of plot is substantial. Protocols are continuously being revised and refined to better measure the established objectives. The goal is to have a standard methodology and protocol for mechanical treatment plots and one for WFU plots. So far, each project has been slightly different so each will have a list of the protocols used and any issues or things that may have changed. (See Appendix F for the standard protocol).

JAN'S PLOTS

In 1970, Dr. Jan van Wagtendonk installed 30 10m x 10m fire effects monitoring plots in three different forest types for his PhD field work. Ten were installed in fuel model 2 ponderosa pine (*Pinus ponderosa*) with bear clover (*Chamaebatia foliolosa*) understory, 10 in fuel model 9 ponderosa pine and 10 in fuel model 9 ponderosa pine with an incense cedar (*Calocedrus decurrens*) understory. The plots were burned in 1971 at different fuel moistures and ignition patterns (control plots were not burned) to help develop prescriptions for prescribed burning (van Wagtendonk 1973). The whole area (including the control plots) was burned in 1972. All plots measure fuels, trees, seedling and saplings, and bear clover cover (when present).

With the assistance of Dr. van Wagtendonk, 29 of the 30 plots were relocated and reread by the fire effects crew in the spring/early summer of 2003. The same variables were remeasured and herbaceous plant species counts and photo points were added. All plots were burned in late May and reread postburn in July. The plot that was not relocated before the fire was located and reread. Postburn data recorded included burn severity on vegetation and substrate, char height, scorch height and scorch percentage on overstory trees. The plots were reread again in 2004, 1 year after the burn.

This dataset is very important and exciting due to the high level of quality and the 30 year time scale. Some of the data was entered into FMAPlus (Fuels Management Analyst) and was used in November 2003 in a presentation given by MaryBeth Keifer, Regional Fire Effects Specialist, at the Association of Fire Ecology conference in Orlando on fuel accumulations in mixed conifer forests. The fuel loading summaries from FMAPlus showed much higher fuel loads than expected. It is unclear what constants were used in the FMAPlus program so the data will be entered into FEAT as soon as possible so that it can be further analyzed and available to other parties. The fire effects crew will continue to read these plots on a schedule similar to other fire effects monitoring plots – YR01, YR02, YR05, YR10 etc.

BURN SEVERITY

Using Landsat imagery for landscape level assessments has been used more and more in recent years. In 1998, Nate Benson, National Fire Ecologist, and Carl Keyes, GIS specialist in Glacier National Park developed a methodology, NBR (Normalized Burn Ratio), to assess burn severity on large fires using satellite imagery. The development of the burn severity map is

a three-step process. First an initial assessment is done using an image taken before the fire and after the fire (in the same year) and differencing the reflectivity (Bands 4 and 7) according to the NBR analysis. The second assessment is done a year later by differencing the reflectivity values of the preburn image and a postburn image both taken at the peak phenological stage a year apart. Third, ground truthing plots rated according to the CBI (Composite Burn Index) are read to calibrate the threshold values between low, moderate and high severity. Beginning in 1999, Andi Thode, a PhD student at UC Davis and a Region 5 Forest Service Fire Ecologist, used a modified CBI plots with additional measurements to assess burn severity on fires in Yosemite National Park and adjacent Sierra Nevada National Forests. The modifications included a larger plot size, brush cover assessment and canopy cover. The extra data collected can be applied to the Kauth-Thomas methodology, another way of determining burn severity with satellite imagery. Ground truthing plot protocols used in Yosemite are a combination of Nate and Andi's methodologies.

In 2002, 58 CBI plots were read on the Hoover fire, a 9,126-acre WFU fire. Forty plots were read on the Wolf WFU and 45 on the Gin Flat prescribed burn in 2003. Mark Grupe, Fire GIS specialist analyzed the plots data using the dNBR method but the data has not been applied to the Kauth-Thomas method.

In 2004, as a request from the Regional Fire Ecologist the Yosemite Fire Effects crew organized CBI training for 7 North Cascades and Olympic National Parks personnel. The training was rather last minute and it snowed the day before and part of the first day but overall, it was successful. Thirty six plots were read in the Whiskey WFU fire and 22 in the Tuolumne fire. Early snow prevented the fire effects crew from reading more plots in the Tuolumne fire. The Kibbie fire burned on both Forest Service and Yosemite National Park Lands so Andi Thode's crew read 30 plots on both land units. One Yosemite fire effects crewmember and 1 Crew 6 crewmember worked with them for a week to better learn Andi's methodology and as field help. All data collected by the Yosemite fire effects crew has been sent to Andi for her analysis as well as to Nate and Carl for the national database.

Burn severity maps can aid resource managers in locating areas of high severity fire and focus on those areas for higher potential of erosion, non-native species or more affected wildlife habitat. It also allows managers to get a sense for what historical gap sizes, mosaic patterns and fuel changes over time are by focusing on areas where WFU fires have burned relatively unaffected by fire suppression.

Next season, CBI plots will be read on the Meadow WFU fire, located in the Illilouette Basin, an area that has seen frequent WFU fire. The crew will continue reading the modified plot

with added components based on Andi Thode's methods so that data can be compared with that of the surrounding National Forests. Andi Thode will also be compiling a burn atlas for the Sierra Nevada by using early Landsat data, as far back as the 1970's, to determine burn severity on fires that burned in the past. This will provide information on the changes in vegetation types in high severity areas, gap sizes and better burn perimeters. For more information on determining burn severity with the NBR methodology, see:

http://burnseverity.cr.usgs.gov/fire_main.asp

FIRE RETARDANT AND SUGAR PINE

There were 39 active Wildland Fire Use fires (WFU) in Yosemite National Park in the 2003 season. Two of these fires, the Kibbie and Tuolumne, were suppressed in late September due to air quality issues. Nearly 250,000 gallons of fire retardant – slurry- was used to aid suppression efforts on both fires. The majority of the slurry was used on the Tuolumne fire, impacting 350 acres along the perimeter. There is no data addressing the effect of slurry on overstory sugar pines but there is concern because this species is declining in the Sierra Nevada. To monitor this, the fire effects crew located, tagged, DBH'd and documented any damage, disease, etc. on 9 live trees affected by slurry and fire, 9 trees affected only by slurry and 10 trees (control) unaffected by slurry or fire. Unfortunately, weather and access discouraged any further sampling. In 2004, weather and access again prevented revisiting all of the trees and only 14 were revisited. So far, no trends have been observed. These trees will be monitored over the next few years for mortality, disease and damage and all of the trees will be revisited next season. Observations of the area indicate that several shrub species are showing adverse effects prompting the plan for more monitoring in the area. A retardant drop was inadvertently dropped on a prescribed burn in the Mariposa Grove and may also be monitored for effects on vegetation.

1911 TRANSECTS

In the early 1900's the USDA Forest Service did an extensive tree demography study on the western slope of the Sierra Nevada. Data collected in 1911 on what is now Yosemite National Park and Stanislaus National Forest was recently discovered. The data for 375 transects, 64 of which are in Yosemite National Park was recently discovered. The transects are large (4 acres each), systematically located in reference to Township/Range Section corners, are spread out over a large area and pre-date effects of fire suppression. Rarely does a historic data set of this level of quality and quantity exist to allow direct assessment of major

changes in ecosystems over many decades. These data will help to better understand the structure of pre-suppression forests in the most heavily impacted forest types (lower mixed conifer) and how to manage them better.

With funding from Joint Fire Science and the Yosemite Fund, the resampling of the transects began in 2002 under the direction of Dr. Jim Bouldin. He developed an algorithm to relocate the transects and designed a subsampling method. He reread some of the transects in 2003 and 2004 but funding for 2005 was not available. With the lack of funding and other issues, the project will now be coordinated by Dr. Scott Stephens of University of California at Berkeley who will begin field work in the summer of 2005.

A project to reread some of the transects was completed as joint effort of the Yosemite Fund, the National Park Service, and a volunteer group from Deloitte Accounting firm in early August. This project represented the first time the Yosemite Fund had funded and coordinated a volunteer research project and it was viewed as a “pilot project” to assess such a volunteer effort. From a National Park Service standpoint, this project also represented the first time that historic data and present data comparisons would be used for fire ecology and analysis in Yosemite. The 4 day project was located around Aspen Valley and required a minimum of 3 hours of hiking each day. Each crewmember lead a group of 3-4 volunteers in the field resulting in data collection on 83 plots, completing 4 of the transects. Despite the rough terrain, primitive camping and lack of amenities, all of the feedback from the volunteers and Yosemite Fund was positive and the fire effects crew was praised for their organization, professionalism, knowledge and skills. See Appendix G for the subsampling protocol used for this project.

SUGAR PINE (PILA) MORTALITY STUDY

It is widely recognized that sugar pine (*Pinus lambertiana*) is disappearing from mixed conifer forests due to white pine blister rust (*Cronartium ribicola*) infection and competition with white fir (*Abies concolor*) and incense cedar (*Calocedrus decurrens*). (Yeaton 1983, Stephenson 1996) The observed increase in mortality of large sugar pines has been even more prevalent after prescribed burns, even very low intensity. Efforts to mitigate against mortality have been used with some success but there is a lack of consensus on which methods to use and the efficacy of the methods employed.

The effectiveness of two mitigation techniques will be evaluated in the PW-03 burn unit (567 ha) planned for ignition in October of 2005. Plot data will be collected until five years after the burn (2010).

Twenty eight sampling plots were established in the PW-3 burn area and 12 will be established in unburned (control) areas next season. On each plot, the 3 trees nearest to the plot center are DBH'd, assessed for damage, insects, vigor rating, presence of white pine blister rust, duff depth around the bole of the tree and assigned a treatment. The trees were either LINED: a 9" moat cleared to mineral soil around the base of the tree, CLEARED: all trees smaller than 15cm DBH and heavy fuels within 2 meters of the bole are removed and CONTROL: no treatment applied. For the full study plan, see Appendix B

EXOTICS SURVEY

There is concern that mechanical thinning and pile burning can exacerbate the introduction and increase of exotic plant species. To monitor this, the fire effects crew, in conjunction with resource management and science staff, developed preliminary methodology and protocol to follow exotic species presence before and after mechanical thinning. In 2002, 20 plots were installed in Yosemite Valley WUI areas that were mechanically thinned. The thinning was completed in 2 different vegetation types, oak woodland and lower elevation mixed conifer on about 50 acres. Ten plots were installed in each vegetation type and reread after the piles were burned in 2003.

Mechanical thinning crews were asked to build piles on the plot location, marked with a piece of rebar with orange flagging. From the plot center, nests of 2m, 4m, 6m and 8m diameter plots were monitored for presence of exotic species. All native species in the innermost 2-meter circle were also recorded. Once the piles were built and burned, the plots were reread in July 2003. Preliminary results indicate that little increase in number of exotics or frequency has occurred. Due to the overwhelming workload in the 2004 season, the fire effects crew was unable to reread these plots. Depending on time constraints and management priorities, the plots will be reread next season.

Exotic species encountered in the plots were: bull thistle (*Cirsium vulgare*), Himalayan blackberry (*Rubus discolor*), cheatgrass (*Bromus tectorum*), chickweed, (*Stellaria media*), red brome (*Bromus madritensis ssp. rubens*), velvet grass (*Holcus lanatus*), and sheep sorrel (*Rumex acetosella*). Of these, bull thistle and Himalayan blackberry are the species of greatest concern. No new species were observed in the YR01 read after the treatments had been completed.

The following is summary table of all of the plots currently active in the program and those that were reread or installed in the 2004 season. (Table 1) Table 2 shows the staff involved in the Fire Ecology program.

Table 1. Monitoring Plot Workload 2004

Park	Monitoring Unit Name/ Total Number of Plots Installed to Date	Total Plots Installed to Date	Type of Plot (FMH, photo point, other – describe)	Pre- burn/ thin 2004	Immed Post/ thin 2004	Post- burn/thin 2004 (1-20 yrs)
YOSE	BAGGI1D01	17	FMH	0	0	0
	FARPA1D05	2	FMH	0	0	0
	FABCO1T08	23	FMH	1	3	15
	FABMA1T08	2	FMH	0	0	2
	FCADE1T10	3	FMH	0	0	3
	FMCMM1T09	10	FMH	0	0	3
	FPIPO1T02	17	FMH	0	0	8
	FPIPO1T09	12	FMH	0	0	1
	FSEGI1T08	13	FMH	0	0	0
	Ponderosa pine/bear clover (Big Creek/Aspen Valley)	41	RETRO	0	0	21
	Ponderosa/mixed conifer	36	RETRO	0	0	36
	Giant sequoia	54	RETRO	0	0	8
	Mixed conifer WUII	62	Rapid Assessment	14	28	0
	Red Fir/Lodgepole (Fire Use)	17	Rapid Assessment	0	0	17
	Montane Shrub (Fire Use)	5	Rapid Assessment	0	0	5
	WUII exotics survey	20	Nested Frequency	0	0	0
	WFU plots	201	CBI	-	58	-
	Ponderosa pine	30	Jan's Plots	0	0	30
	Sugar Pine/fire retardant	30 trees	Tree data/photo point	-	0	14
	Sugar Pine Mortality	28	Sugar Pine Mitigation	28	0	0
	1911 transects	4 transects 84 subplots	1911 transects	-	-	4
Total		396 (excluding CBI and 1911 plots)	9 protocols	43	110	132

Table 2. Fire Ecology Staffing 2004

Employee	Starting Date	Ending Date	# of Pay Periods	Training and Development
Kara Paintner	01/01/04	06/28/04	13	READ training
Jen Hooke	07/26/04	12/13/04	9	120 day DETAIL
Monica Buhler	04/05/04	current	22	FFT1 trainee, RX-510, READ, Measuring and Monitoring Plant Populations, Statistics
**Ilana Abrahamson	05/18/04	12/11/04	15	S-290, Poaceae
*Isaiah Hirschfield	05/18/04	11/19/04	13.5	FFT1 trainee, RX-310, S-217
*Maureen McGlinchy	05/18/04	11/19/04	13.5	S-290, Herbarium
*Elizabeth Ayres	06/01/04	08/09/04	5	S-290
*Colleen Ross	08/24/04	11/19/04	6.5	

*** = Term employee * = seasonal/temporary employees

OTHER ACTIVITIES

Fire Effects crewmembers are also involved in preparing and implementing fire management projects to gain knowledge, experience and to better understand the role of fire in ecosystem restoration.

FIRE

2004 was an interesting year for fire in Yosemite. There were 12 fires managed as WFU (Wildland Fire Use) throughout the summer. The largest, the Meadow fire was located in the Illilloutte basin and was ignited on June 27 along with several other fires. The fire grew very slowly during the first 2 weeks and then on July 12th grew from 50 to 1500 acres and continued to grow to 5000 acres by July 16th. This relatively rapid growth is more characteristic of fire behavior observed in mid to late August so a WFU team was brought in and containment of the fire occurred on the north and west perimeters to limit the threat to Little Yosemite Valley and reduce smoke impacts to Yosemite Valley. For three weeks the fire was managed as a WFU with growth continuing to the south and east. The unhealthy levels of PM 2.5 (Particulate Matter) in Yosemite Valley, obscured visibility and that it was early on in the fire season were all considerations for the decision to directly contain the Meadow fire on July 26th. All other WFU fires throughout the park were also contained at this time.

An amendment in the Fire management Plan allows for reignition of WFU fires and plans were made to relight the Meadow in the fall when fewer visitors would be affected by the smoke. Unfortunately, the rapid growth of the fire and uncertainty of management actions discouraged the installation of rapid assessment plots. Since the fire effects crew was unable to install plots, a simple monitoring design for photo points was developed for Crew 6, Yosemite fire use crew, and fire use modules on the fire. The crews established 30 photo points, collected general

location information and soil samples. The plots were located around the perimeter of the fire in hopes that those areas would be burned when the fire was reignited in the fall. See Appendix C for protocol description.

The relight of the Meadow fire began on October 11 and continued until a snowstorm on the 17th brought a season ending event. 600 additional acres were burned on the northeast end. The relighting of the Meadow was a monumental event in the National Park Service and may help pave the way towards more use of fire in the WFU zones of the park.

Due to dry conditions, an early season ending event, and arsonist and air quality issues, relatively little prescribed burning, 365 acres, was accomplished in 2004. There was a very short spring burning window and portions of units were burned in Yosemite Valley and Big Creek though it was soon too dry to complete any units in El Portal. No more prescribed burning occurred until late September and early October when units were burned in Mariposa Grove and Yosemite Valley. In early October, all planning and focus was placed on relighting the Meadow fire and burning PW-3, the Gin Flat burn unit. The planned ignition of PW-3 was planned for the same week as the Meadow WFU relight but kept getting postponed until October 16 due to air quality issues. The planned ignition was again postponed when news of an arsonist in the Hetch Hetchy area was reported. Snow and rain came that night effectively ending the prescribed burning season. The Hetchy fire burned 2300 acres before this season ending event. Due to safety issues and the pending storm, no suppression actions were taken on this fire.

Previous to 2001, very few fire monitoring reports were completed following prescribed burns and preburn data on fuel moistures, weather, etc., were not consistently taken. Standard operating procedures (SOP's) for monitoring prescribed fires were introduced in the 2002 season and helped enormously in the 2003 and 2004 season. There was less need for fire effects crewmembers to act as lead FEMO on the majority of the prescribed fires or to complete all of the monitoring reports. Fire effects crew members trained or acted as FEMO on 4 prescribed burns. Three crewmembers went to Sequoia and Kings Canyon National Parks to assist on a prescribed burn, 1 crewmember went on a detail with the Whiskeytown Fire Use Module and 1 crewmember went to Lassen National Park for 2 weeks with Crew 7, the hazard fuels crew. All crewmembers were involved in fire management activities acting as Helicopter crewmember, READ, FEMO and FFT2 in ignition, holding burn prepping and line cutting.

Resource Advisor - READ

Resource management issues have not always been satisfactorily addressed in the planning and implementation process of prescribed burns, wildland fire use and suppression

fires. To help remedy this, Jun Kinoshita, Fire Archeologist, and Kara Paintner, Fire Ecologist established a program in 2002 to encourage and organize involvement from Resource Management and Fuels and Ecology staff and to ensure that a READ is present or notified of all fires occurring in the park. The presence of a READ on fire management projects can help prevent negative, unnecessary or undesired impacts to the resources. In early 2004, Jun and Kara put on a READ training locally that several Resource Management staff attended increasing the number of qualified personnel for the position. A call-out list was developed so that potential READs could sign up for the week that they would be available to fulfill READ duties. Summer is a busy time for all employees in Yosemite National Park but the weekly commitment seemed to work better than an entire pay period as was requested in 2003.

In 2004, there was a high demand for READ during the Meadow fire and several Resource Management staff participated and experienced their first fire. The WFU team managing the fire was pleased with the feedback and resource damage was minimized. Monica Buhler spent several days as READ but most duties were managed by Resource Management staff. Jen Hooke arrived in late July for a 120 day detail in the Fire Ecologist position and was asked to take over Kara Paintner's duties and help coordinate the READ program. She was unable to assist on this much as she has not acted as READ nor taken the class.

The presence of a Resource Advisor, better documentation of what is occurring on prescribed burns and preliminary results of the measurable objectives will improve relations and the feedback loop between resources and fire management. The goal remains to have greater involvement by Resource Management staff and adequately represent resource concerns and objectives into the planning and implementation of all fire operations. A full report on the READ activities of 2004 can be found on the Yosemite network server: [inpyosems11/Commons/Resource Advisor Kit/READ 2004](http://inpyosems11/Commons/Resource%20Advisor%20Kit/READ%202004).

PLANTS

A study collection was started during the 2000 season to deal with the backlog of collected plant specimens. In past years, plant specimens had been collected, pressed in newspaper, often not labeled and left to collect dust. Almost all of the old specimens have been identified, mounted or dealt with appropriately. More specimens are collected each season but there is often not enough time allotted to deal with them appropriately. This season, Maureen McGlinchy, a second year seasonal, took over the project and has made huge progress in organizing the unknown plant list, lumping unknown species, applying her knowledge of

herbarium practices in mounting specimens and entering all of the data into a Microsoft Access database.

Until 2000, there was virtually no documentation of the unknown plants found on plots. ID codes were apparently assigned at random resulting in a completely unusable and unorganized plant list. An unknown plant database in Microsoft Access was developed and is now being used to document and better organize unknowns. All of the current unknowns were reviewed and all have been assigned appropriate codes. Several unknown species with absolutely no description or specimen were lumped into a generic group. Some genera that are not endangered or sensitive and are incredibly difficult to ID to species were also lumped. A strict protocol on how to deal with new and current unknowns has been developed and will aid in maintaining a more usable and accurate plant list.

Maureen made great progress in cleaning up the database and identifying specimens making the unknown plant situation more manageable and less of a detriment to data quality. "A Yosemite Flora" a relatively recent publication by Steve Botti, continues to improve plant identification confidence and accuracy.

Sensitive plants

A population of Wakerobin, (*Trillium angustipetalum*), a park sensitive species, occurs in Wawona and was being impacted by mechanical thinning and piling. The population had not been surveyed before and piles were located on top of plants. Monica Buhler surveyed the area according to the protocol developed by Peggy Moore, USGS vegetation ecologist, early in the spring. It was determined that burning the piles on top of the plants would cause mortality so the piles were moved and burned in another location. Further monitoring will be done next season and the fire effects crew will collect as much data on sensitive plants as possible to aid Resource Management.

SLIDES

There are over 5000 slides stored in the fuels and ecology office that have not been used for years. In the past, FMH plot slides were stored in the plot folder and taken out into the field. Due to the value of these slides, they have been removed from the plot folders and properly stored in archival quality slide covers. All current plot photos are developed into slides, pictures and digitally on a CD. A project to scan all old slides was started in the winter of 2001/2002, but due to the lack of equipment and network storage space, only about 300 slides were scanned. The project will continue when the proper equipment and support becomes available.

There is a push by some to go to digital cameras for all photo records. There are still storage, longevity, quality and potential legality issues when using only digital documentation. The Yosemite fire effects crew continues to take slides and have the developers make a CD of digital images as well.

METADATA

Yosemite National Park is currently working on compiling and organizing metadata for all of the research and monitoring in the park. All of the information about each dataset will be entered into SMMS (Spatial Metadata Management System) and will be accessible to interested parties. The required elements for the metadata: Title, purpose, when, where, who, why and how the data is collected was compiled for FMH, Retro, Burn Severity, Exotics, Rapid Assessment style plots and fuel moistures sampling and given to metadata managers. When FEAT is more functional, the metadata will be updated so the database will be accessible for more people.

ECOLOGIST ACCOMPLISHMENTS

It was an interesting year for the ecologist position. Kara Paintner left in late June after 4 years as the fire ecologist and Jen Hooke came to Yosemite on a detail at the end of July to mid-December. Monica Buhler, lead fire effects monitor will start a detail into the position beginning early February until the position can be hired permanently.

FIRE MANAGEMENT PLAN

The draft EIS (Environmental Impact Statement) portion of the Fire Management Plan (FMP) was released in May 2002 and was open for public comment in June through August of 2002. Revisions were made and the final draft was released in March 2004. This was a huge accomplishment for Kara Paintner as most of her time and energy was spent on this plan. Now there is a need for a Fire Monitoring Plan that will be added as an appendix to the Fire Management Plan. Jen Hooke and Monica Buhler completed a draft outline in September and after the defense of her thesis in February, Jen and Monica will begin working on the plan itself. See Appendix E for the draft outline.

MONITORING

The fire ecologist is responsible for developing and implementing new monitoring protocols in response to trends observed in existing monitoring data or to better answer management questions. New monitoring is also developed to better determine cause and effect and whether treatment objectives were met without negative effects. The Rapid Assessment protocol was developed and implemented in 2002 and continues to be utilized and refined in mechanical thinning and WFU areas. New prescriptions outlined in the FMP allows for cutting of trees up to 20" DBH along roadsides. Fourteen Rapid Assessment plots were installed in potential locations for this treatment which is being currently implemented. The effects of more intrusive and potentially higher impact techniques for mechanical thinning will potentially be captured by these plots.

Data from current monitoring indicate that prescribed burns are causing high sugar pine mortality but the existing data is minimal and extremely variable. In response to this, Jen Hooke and Monica Buhler developed a new monitoring protocol that can be applied and perhaps indicate predictors and cause of high sugar pine mortality. It may also help direct managers to treatments that will have a less negative affect on sugar pines. For a complete description of the Sugar Pine Mortality Study design, see Appendix B.

PRESENTATIONS

The fire ecologist is frequently asked to provide information and presentations to the public, other park employees and special groups and clubs. Before she left, Kara Paintner gave presentations to the Rotary Club, a Fresno State University class, Yosemite Fund, local community public meetings, in-park meetings and Experience Yosemite, a monthly program for people from local communities to visit Yosemite and meet employees and hear about specific programs. These kinds of presentations are critical for soliciting support for the program and educating the public.

In Kara's absence, Monica Buhler gave 4 presentations for Experience Yosemite, spoke to a Terrestrial Ecology class from Fresno State University and presented data to several different divisions in Yosemite National Park. Due to the current state of the databases, very little data was analyzed this season so no presentation or poster was done for the Mixed Severity Fire Ecology conference in November 2004.

READ

Resource management personnel are sometimes excluded from the fire planning and implementation process and the potential effects on natural and cultural resources. To remedy this, Kara Paintner and Jun Kinoshita established a Resource Advisor (READ) program in 2002. This has helped in involving more personnel from resource management into fire management and ensuring that resource concerns are addressed. The fire ecologist acts as a liaison between fire and resources and Kara did an excellent job developing the program. A READ kit was organized including maps of sensitive cultural and natural resources, standard SOP's for the position and general fire information. The kit allowed people with minimal experience to come onto the job with some basic knowledge. In Kara's absence, Jun Kinoshita has successfully taken over the program. The future fire ecologist will again take on duties to further involve resource management in fire actions.

RESEARCH:

Kara Paintner had solicited a lot of research through Joint Fire Science, the Pennsylvania State University and University of California at Berkeley. She had acted as COR (contracting officer) on several projects and in her absence the duty was passed on to Brian Mattos, park forester. Jen Hooke was unable to coordinate or solicit more research in her short time here. The following is the current research occurring in the park.

1911 Forest Transect Study

In the early 1900's the USDA Forest Service did an extensive study on stand structure on the western slope of the Sierra Nevada. 375 Transects covering 10% of 40 acre sections were read in the Stanislaus National Forest and Yosemite National Park. The data recorded from 1911 was recently relocated and Jim Bouldin submitted a proposal for the study and began preliminary data organization and coordination in 2003. Funding for the initial year of the project came from both NPS-FIREPRO and the Yosemite Fund. Funding for the second year of the project was not awarded so little progress was made in 2004. Jim Bouldin wrote a study design for the fieldwork and reread 10 of the transects. Due to the lack of funding and personnel issues, the project was given to Dr. Scott Stephens of the University of California at Berkeley to begin in 2005. It is critical that some of the transects are read next season because it is likely that they will burn in the PW-3 Gin Flat burn next fall.

This data is invaluable due to the length of time that has passed since the survey was completed, the absence of logging and fire in most of the area and the location in lower mixed conifer forests, areas with the highest FRID (fire return interval departure). This forest type is

where the Fuels and Ecology program implements most treatments and knowledge of pre-suppression stand structure and species composition is key in refining target conditions.

Identifying Reference Conditions for Prescribed Fire Management of Mixed Conifer Forests in Yosemite National Park, California

Kara Paintner and Dr. Alan Taylor, The Pennsylvania State, received a grant through the Joint Fire Science Program to study fire history of lower mixed conifer forests in Yosemite National Park. PhD student Andy Scholl and 3 undergraduate students arrived in May and worked until August for the third and final season of the project.

The goal of the project is to identify natural reference conditions for mixed conifer forests from which prescribed fire managers can develop process and structural goals for reintroducing fire to altered forests. The project is designed to fill critical gaps in knowledge needed to develop and implement Yosemite National Park's fire management plan. The specific project objectives are to: 1) quantitatively describe pre-settlement, settlement, and fire suppression period regimes; 2) identify how fire regimes vary along major environmental and forest compositional gradients; and 3) identify pre-fire suppression forest characteristics (basal area, density, size structure) at plot and landscape scales. Technology transfer will occur with a combination of written materials, presentations to agency staff and interagency organizations, and a worldwide web site.

Collection of field data for two study areas is now complete. Study area 1 (located in the South Fork of the Tuolumne drainage): forest structure data (size, age, composition and spatial pattern) was collected on a grid of 47 plots, covering all slope aspects, over 10 km² in the South Fork of the Tuolumne drainage. Fire history at the grid points will be estimated from 104 fire scar samples collected on the grid. Study area 2 (located in the South Fork of the Merced River drainage): forest structure data (size, age, composition and spatial pattern) was collected on a grid of 57 plots, covering all slope aspects, over 11 km² in the South Fork of the Tuolumne drainage. Fire history at the grid points will be estimated from 140 fire scar samples collected on the grid.

Analysis of the fire scar data suggests that the area experienced very frequent, low to moderate severity fires before 1900. The average fire return interval (FRI) for individual trees was 17 years (range 2-88yrs.), while the composite average FRI for the entire study area was 3 years (range 1-5). Only 4 fires occurred in the 20th Century and they were only recorded on single trees. The reduction in fire is coincident with increased efforts to suppress fire in the park and the fire free period is about 10X longer than before fire suppression. Fires occurred mainly near or at the end of the tree growing season (32% latewood, 38% dormant). Maps of pre-fire

suppression fire extents indicated that the fires ranged in size from individual points (single trees scarred) to the entire study area.

Reconstructed pre-fire suppression forest structure reconstructed by subtracting radial growth from each tree core equal to the number of years since the last recorded fire indicate that the forest was composed mostly of ponderosa pine and sugar pine, with lesser amounts of incense cedar. On mesic sites, there was a significant component of white fir and Douglas-fir in the overstory. The post fire-suppression understory is mainly incense cedar and white fir. Very little ponderosa pine or sugar pine occurs as seedlings or saplings in the understory. The density of the forest has increased from an average of 140 trees/ha in 1899 (time of last fire) to an average of 1000 trees/ha in 2002. In contrast, there was little change in the forest basal area. Over the same time period, basal area averaged 101m²/ ha in 1899 and 109m²/ ha in 2002. At the same time there has been a compositional shift from fire tolerant species (ponderosa pine) to fire intolerant species (white fir). 2004 was the final field season of the study to fill in the gaps fire history record and summarizing all of data. Andy Scholl plans on completing his dissertation in August of 2005 and submitting his data findings to the park.

Yosemite Valley Fire History

A study through Dr. Alan Taylor to look at fire history in Yosemite Valley began in 2004 by graduate student Casey Decker. All of the fieldwork was completed although Casey is no longer on the project. The data analysis will continue under another graduate student yet to be selected.

A major stumbling block for resource managers implementing this policy in Yosemite Valley is the need to identify quantitative reference information for the frequency, extent, and season of burn for forests in Yosemite Valley prior to Euro-American Settlement in the mid 19th century. Changes in the frequency and extent of fire did occur in Yosemite Valley after Euro-American settlement, especially after the establishment of Yosemite National Park in 1890 and the implementation of a policy of suppressing fire. Changes in the presettlement fire regime are also known to have altered the structure and composition of presettlement forests in Yosemite Valley. Removal of fire for more than century has caused an increase in forest density and a compositional shift from oaks towards pine and fir. These vegetation changes have also altered the structure and quantity of surface fuels compared to the presettlement period. Data on presettlement fire regimes in Yosemite Valley are not sufficiently precise to guide implementation of prescribed fire use for resources management in Yosemite Valley that are proposed in the Yosemite Valley Plan, the Yosemite Fire Plan, the Wildland-Urban Interface Initiative, and the Cultural Landscape Management Plan. This project is designed fill the gap in

knowledge on presettlement fire regimes for Yosemite Valley that is needed to implement resource management plans. The specific objective of this project is to quantify pre-settlement, settlement, and fire suppression period fire regimes (i.e. frequency, return interval, seasonality, and extent of fires) in Yosemite Valley.

Other Fire Related Research Occurring at Yosemite

- Linn Gassaway, graduate student at San Francisco State is looking at the spatial patterns of fires related to Native American village sites in Yosemite Valley.
- Matthew Hurteau, graduate student at UC Davis is looking at forest understory fuel response to global climate change and atmospheric pollution in northern part of the park near Crane Flat.
- Dr. Scott Stephens from UC Berkley is examining reburn patterns in wildland fire use areas (the Illilouette basin).
- Susan Roberts, graduate student at UC Davis is examining spotted owl populations and fire occurrence.
- Dr. Jan van Wagtendonk is developing fuel model and burn severity maps using TM and AVIRIS imagery.
- Carol Miller has initiated a project to look at lightning ignitions in the past decade and using real weather data and fire spread models to project what the landscape would look like had those fires been allowed to burn as WFU. Other principle investigators include: Anne Black, Tony Caprio of Sequoia and Kings Canyon National Parks and Mike Beasley of Yosemite.
- Matt Ashby is looking at microbial genetics in burned and unburned areas.

For more information on these research projects, contact Monica Buhler, Brian Mattos, Park Forester or Dr Jan van Wagtendonk, USGS scientist.

DATA ANALYSIS

Although the condition of the data, updates on monitoring types and data collection constancy has improved, all results will be considered preliminary. All plot data collected this season has been entered into FEAT, the new Fire effects database while all of the previous years' data is still in the old DOS-based FMH database. The conversion program to put the data currently stored in the FMH database is still being developed. Until all of the data is in one

database, analysis will be postponed. No new FMH plots were installed this season so the minimum plot calculations done in 2003 remain the same. See Table 3.

So far, only plot data from FMH style plots has been entered into a somewhat working database. All data from other protocols such as Retro and Rapid Assessment are now being entered into FEAT but since the database is still in preliminary stages of functionality, analysis on these protocols will not occur until all of the data can be entered and the bugs in the database are fixed. Some data for the rapid assessment plots was entered and analyzed in FMAPlus (Fuels Management Analyst) and CrownMass[®] and was presented in a poster at the Association for Fire Ecology Conference in November of 2003. Fuels data for Jan's plots and WFU rapid assessment plots were also entered into FMAPlus (Fuels Management Analysis) and basic summaries were calculated for general projects.

MINIMUM PLOT CALCULATIONS

Preburn minimum plot calculations were done for 4 vegetation/monitoring types (see Table 3). These calculations do not include any plots that are not in designated burn units.

Postburn (YR05) minimum plot numbers were also calculated for FABCO1T08 and FPIPO1T02 since preburn minimum plot numbers have been achieved in the fuels and overstory trees monitoring variables. Recalculating minimum plot numbers postburn is important for determining how the postburn data variability compares to the preburn data variability. Often postburn data variability is higher than the preburn variability, and more plots need to be installed. If the postburn data variability is lower or the same as the preburn variability, the need to install more plots is less necessary. As shown in the table below, there is high data variability YR05 postburn in pole-size trees but less variability in fuels and overstory trees than in the preburn measurements. In FABCO1T08, overstory tree data variability postburn is somewhat higher than preburn variability but there still are enough plots installed to have 80% confidence for this monitoring variable. Many more plots would have to be installed to sufficiently monitor pole-size trees (n=10). Considering YR05 postburn data for FPIPO1T02, there are enough plots for 95% confidence in fuels and enough plots for 80% confidence in overstory trees. Many more plots would have to be installed for any level of confidence for pole-size trees (n=17). Due to the clumping nature of pole-size trees it will be challenging to have enough plots to monitor them effectively. This is another reason for installing more and faster plots spread over a larger area like rapid assessment to better capture them.

Minimum plot calculations are not reported for 4 monitoring types. There are not enough plots installed (less than four) in incense cedar/mixed conifer forest (FCADE1T10), red fir

(FABMA1T08), montane chaparral (FARPA1D05) and ponderosa pine mixed conifer (FPIPO1T09). The current sampling techniques do not adequately measure monitoring objectives for lower montane meadows (BAGGI1D01). This dataset is being reevaluated this winter in conjunction with the writing of the fire monitoring plan.

Table 3

Monitoring Type	Number of plots used in analysis	Primary Variable (Fuels)		Secondary Variable (Overstory Trees)		Tertiary Variable (Pole-size Trees)	
		20/80%	20/95%	20/80%	20/95%	20/80%	20/95%
FABCO1T08	21	6	14	2	5	17	43
FABCO1T08 (post)	10	16	43	5	13	214	573
FPIPO1T02	17	19	49	7	17	45	114
FPIPO1T02 (post)	17	17	44	8	20	70	176
FMCMM1T09	10	13	36	7	19	21	57
FSEGI1T08	13	14	37	14	36	76	200

Numbers in **BOLD** indicate minimum plot numbers achieved.

Summary of fire effects plots burned

In 2004, 3 FMH plots were burned for a second time. No analysis was done on these plots due to database issues and the small sample size. Further analysis was done on 9 plots burned in the PW-3 burn unit in 2002. A complete summary of this data can be found in Appendix A.

CURRENT AND FUTURE PLANS

The 2004 season will be very busy and perhaps even more varied than the last. Seven different types of fire effects monitoring plots are currently being read and will increase the fire effects program's ability answer questions for fire and resource managers.

FIRE MONITORING PLAN

The draft EIS (Environmental Impact Statement) portion of the Fire Management Plan (FMP) was released in May 2002 and was open for public comment in June through August of 2002. After revisions were made the Final Draft was released in March of 2004. A basic outline of the Fire Monitoring Plan, an appendix to the Fire Management Plan was completed by Jen

Hooke and Monica Buhler in September 2004. Jen Hooke will work on the plan after her thesis is completed in March 2005.

MONITORING

Current monitoring will continue in all of the current protocols and in response to management issues more will be developed. Meadows comprise about 1500 acres in Yosemite National Park. While the number of acres is relatively small, the importance of meadows in the ecosystem is critical. Current monitoring protocols do not satisfactorily measure management objectives and refinement of prescriptions, firing techniques etc. is not occurring. Over the winter, a monitoring design will be developed in conjunction with resource management staff to monitor meadows more effectively.

Data from plots analyzed for a presentation given by Monica Buhler last year at the Fire Ecology conference in Orlando suggest that prescribed fires may be adversely affecting Black Oak (*Quercus kelloggii*). Current monitoring protocols used do not sample black oaks effectively to determine cause of mortality and lack of recruitment. There is a need for further monitoring of this species. Over the winter, attempts will be made to develop a monitoring protocol that will be planned for implemented next season.

FPA (Fire Planning Analyst)

A new interagency fire management budget tool is in development that will greatly affect how and how much the Yosemite Fire program will get funding. Funding will now be awarded to FPU (Fire Planning Units) that include Yosemite, Stanislaus NF, Sierra NF, Los Banos USFWS, and BLM and that will be divvied up among the different units based on weighing factors. Attributes and weighing factors will justify resources for fire protection and mitigation. Yosemite Fire has been working with Resource Management and Science and Contracting to first select attributes that are critical and then to determine the weighing factors for each at several fire intensity levels (FILs) and sensitivity periods (in-season/out of season). The values selected by Yosemite Park staff will become the beginning point for negotiations with our FPU partners. A series of meetings with partners will begin in mid-January. The final outcome of the meetings will be one list of attributes and weighing factors for the entire FPU. FPA will be implemented in 2007.

FPA has required that the fire history, weather data, fuels and vegetation maps and all GIS data be up to date and accessible. In July of 2004, Pat Stephens, a member of the FPA team, assisted Yosemite in refining vegetation/fuel types and expected fire behavior throughout

the park. Some plots data was used to add fuel loading information and fire behavior predictions.

CHALLENGES

As more acres are treated each year in Yosemite National Park, it is becoming more challenging every year to adequately monitor the effects of those treatments. Many of the thinning projects are completed by contractors who come in and complete the project very quickly allowing very little time to place plots in front of them. Though the fire effects crew is reading and installing an impressive number of vegetation monitoring plots each season, statistically valid data is still not available to determine whether management objectives are being met.

With such a busy fire program, there is also high demand for firefighters, FEMO and READ and the fire effects crew is often unable to supply personnel to help out with burns due to the heavy workload and limited availability during the suitable phenological stage for reading plots. A 4th seasonal was added to the crew in the 2004 season and this allowed crewmembers to help on fires more while the work was still getting completed. The addition of a Term subject-to-furlough GS-06 assistant lead position will help maintain continuity in the program and with preparation for the field season.

The absence of a fire ecologist is also very challenging for the program. Jen Hooke provided enormous amounts of assistance but was only here a short time. Monica Buhler will detail into the position for 120 days but this will leave the lead fire effects position unfilled. Hopefully, the position will be hired before the beginning of next field season. Without this position, coordination with Resource management, expertise and direction on ecological issues, objectives and data analysis will be compromised.

CONCLUSION

The Yosemite Fire Ecology and Monitoring program has undergone many changes since it was first established in 1978. Data quality was good until the early 1990's when different priorities were emphasized for the fire effects crew. More constancy in the program over the last 4 years has greatly increased data quality that had been compromised in the 1990's. The lack of personnel expertise and continuity, data quality, and support still creates issues when examining the data from that time period. It is difficult to confidently analyze some of this data and to determine what data should be kept or retired. The introduction of different monitoring techniques will help to more adequately answer management questions in less time and better

prioritize rereads and analysis of existing data. With the goal of the fire management program to treat 16,000 acres a year, there is no lack of work for the Fire Ecology program. It will continue to respond to data requests and needed vegetation monitoring to create a more effective and ecologically responsible fire and mechanical thinning program.

Additional Information and Appendices

REPORT COMPILATION

The information of this report and the appendices was compiled, written and edited by Monica Buhler, Lead Fire Effects Monitor

APPENDICES

The following appendices are referenced in the report. All of them as well as the full report can be found on the [inpms11 /Commons/resource advisor kit/fire ecology 2004 annual report](#) or [inpms22/Prot/Fire/Effects/ANNUAL REPORTS/2004 annual report](#). For more information, contact Monica Buhler at (209) 375-9572 or email monica_buhler@nps.gov

Appendix A – Summary of trends and objectives

Appendix B – Sugar Pine Mortality Study

Appendix C – Meadow WFU photo protocol

Appendix D – Table of burn units with plot locations

Appendix E – Draft Fire Monitoring Plan Outline

Appendix F – Rapid Assessment Protocol

Appendix G – 1911 Transect Protocol

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