



**National Park Service
CENTRAL AND SOUTHERN CALIFORNIA
Fire Ecology Annual Report
Calendar Year 2008**

**Channel Islands National Park
Golden Gate National Recreation Area
Joshua Tree National Park
Pinnacles National Monument
Point Reyes National Seashore
Santa Monica Mountains National Recreation Area**

Summary

The Fire Effects Monitors for the Southern and Central California Fire Ecology and Fire Effects Program worked in a record number of parks this year (eight) and provided assistance to the Klamath-Cascades network for the fourth consecutive year. The Bay Area Network Fire Ecologist focused on planning and coordination between divisions, research and outreach, and continued progress on her PhD program. The Mediterranean Coast Network Fire Ecologist continued to try to identify critical information gaps necessary for fire management planning in the complex WUI of the Santa Monica Mountains NRA. This coming year the fire ecologist will be focused on supporting the development of CWPPs, developing a monitoring program for the defensible space and strategic fuels treatment areas, and reducing the data analysis backlog.

Fire Effects Crew

The crew's season began in April and the first monitoring trip was to Pinnacles. The crew installed new yellow starthistle plots in the park's recently acquired 2000 acres of oak savanna (the Bottomlands burn unit). However, the burn was postponed until 2009 due to other fire activity in the area. At Santa Cruz Island, part of Channel Islands NP (CHIS), the FEM crew collected a second year of data for a project to assess shrub regeneration in island coastal sage scrub after wildfire. The crew also completed plot work at Santa Monica Mountains NRA

(SAMO) on the same trip. This was followed by a second trip to SAMO without the Lead Fire Effects Monitor where the crew completed year 03 reads for the Topanga Fire plots. The entire crew made a third trip to SAMO in late June, and did brush plots and burn severity plots in two wildfires.

In July, the FEM crew shifted gears and headed north, traveling to Lava Beds NM (LBE) to assist the Klamath Network. Plots were installed in western juniper woodland in preparation for the Valentine prescribed burn. Because this was a new monitoring type, Paul Reeberg accompanied the crew and assisted with pilot monitoring, sampling design and plot installation. A second northern trip took place in August, and was split between Crater Lake (CRLA) and LBE. At CRLA, reads were completed for lodgepole pine plots that burned in the 2007 Cornerstone unit. The FEM crew then returned to LBE, to work with the Redwood crew to complete plot installation for the Valentine burn as well as immediate-post reads for the 2008 Jack Fire. In between these trips, the crew also completed plot work at Golden Gate NRA and Point Reyes NS.

The seasonal crew finished in October, but before doing so had time for several additional projects. At PORE, they assisted with ground-truthing Scotch broom and in collecting tanoak acorns for UC Berkeley researchers who were studying Sudden Oak Death. The crew also entered a seven-year backlog of data from SAMO forb plots. The crew participated in two prescribed burns which were carried out at PORE. Late in October, the Lead Monitor traveled to Lassen Volcanic NP to participate in the Butte Lake prescribed burn as a FEMO and to complete monitoring efforts.

Bay Area Network Fire Ecology

The Bay Area Network Fire Ecologist continued coordination between the fire and resource management divisions at PORE, PINN, and GOGA. She also worked to move forward planning efforts at network parks including the start of a 5 year plan at GOGA and a yellow starthistle eradication project at PINN using prescribed fire. Beyond ongoing planning work, data analysis, and supervision, the Fire Ecologist also focused on expanding fire ecology research, public outreach and presentations, and education.

Research

Two research projects dealing with the fire and forest ecology of the non-native forest pathogen, *Phytophthora ramorum*, which causes the disease Sudden Oak Death (SOD), were completed or are ongoing in the Bay Area Network. A research project on the long-term ecological impacts of the disease was completed through a CESU collaboration with UC Berkeley. A final report from this project, *Spatial Distribution and Impacts of Phytophthora ramorum and Sudden Oak Death in Point Reyes National Seashore*, was completed and published on the PORE website. Results from the research were also presented to the public at a very well-attended brown bag lunch at Point Reyes. Tanoak acorn collection was also carried out to support an ongoing research project on the resistance of tanoaks to SOD. Additionally, an analysis of post-Vision-Fire vegetation change at Point Reyes National Seashore was completed. This included vegetation mapping and analysis of various factors influencing vegetation. Burn severity data for the 1995 Vision Fire were obtained for this analysis through the National Burn Severity Mapping Program.

Presentations

The Fire Ecologist presented information on the Bay Area Network Fire Ecology and Fire Effects Program in a number of different settings. She organized and presented data to fire and natural resource managers the 3rd Annual Fire Effects Forum for PORE & GOGA. She also gave presentations at the NPS PWR Natural Resource Managers Meeting and assisted with content and filming of an educational film on the ecological and fire-related impacts of Sudden Oak Death.

Education

The Fire Ecologist continued work on her PhD in the Stephens and Moritz labs at UC Berkeley during 2008. She is on a half-time work schedule to allow time for her course work. This program provides a unique opportunity for the Fire Ecologist to expand her expertise in fire ecology, statistics, and research design. She initiated field work at Crater Lake National Park on a part-time basis during the summer of 2008.

Mediterranean Coast Network Fire Ecology

The Mediterranean Coast Network Fire Ecologist continued to try to identify critical information gaps necessary for fire management planning in the complex WUI of the SMMNRA (see Table). She is working with students and faculty members from local universities (CSUN, CSULB, and UCSB) to identify collaborative projects with graduate students that the park can not complete on its own because of lack of funding or staff. When funding is available we have found that student support has been one of the most effective means of obtaining high quality research (Pepperdine, CSUSB). The Pepperdine collaboration has been especially valuable in understanding the mechanisms of vegetation recovery after fire and the potential threats from the interaction of fire with climate change.

Weekly meetings between fire management and resource management staff have greatly facilitated coordination of ongoing work. The completion of the new defensible space database will allow the park to identify the need for fuels projects along the interface in a more systematic and consistent manner. The park has implemented its strategic fuel modification strategy at five locations. The park will apply for funding from the Hazard Fuels Research Reserve Fund to hire a GIS student to model whether there are other locations that might provide strategic locations where fuel modification could be effective in limiting wildfire spread. All fuel treatment projects have been approved or renewed for 2009 as Cat Ex's. Finally, the fire ecologist helped complete the first CWPP plan and its environmental compliance. This CWPP will provide a template for other SMMNRA CWPPs, so that adoption of new plans should be more rapid in the coming year.

The Nov 24, 2007 Corral Fire occupied a large part of the fire ecologist's time. In addition to coordinating the implementation of the plan, she oversaw the installation of post fire monitoring plots by the park's I&M staff with help from student interns.

This year the fire effects crew completed the last of the SAMO legacy FMH plots (CHIS was completed last year) and the Cheeseboro prescribed burn/Topanga Fire grassland plots. They also monitored the CHIS wildfire plots on Santa Cruz Island and assisted in collecting burn severity data from the Corral and Canyon fires. The park will continue to monitor the grassland plots in the Cheeseboro strategic fuel modification area. The crew was very helpful in entering grassland plot data into FFI. The fire ecologist is working on developing a new protocol for shrub regeneration plots so that the data from these plots can be entered into FFI.

This coming year the fire ecologist will be focused on supporting the development of CWPPs, developing a monitoring program for the defensible space and strategic fuels treatment areas, and reducing the data analysis backlog.

Fire Effects Plot Workload 2008

Channel Islands National Park

The crew visited Santa Cruz Island in order to do year 02 reads of the plots installed last year in the Cruz wildfire. This is a study of island shrub regeneration after fire. These data have not yet been entered into FFI, although data were entered from the two fennel regeneration plots into Excel (from which they can later be imported to FFI).

Park: Channel Islands

Monitoring Type Name	Number of Plots Read in 2008			Total # of Plots, by Monitoring Type	
	Pre-burn	Immediate Post	Postburn, (1-20 yrs)	Burn	Control
SRI Coastal Sage Scrub (<i>Artemisia</i>)				7	14
SRI Coastal Grassland (<i>Nassella</i>)				9	10
SCI Fennel				5	0
SCI Mixed Fennel				7	0
SCI Fennel Regeneration			2	2	0
SCI Mixed Coastal Sage Scrub				6	0
SCI CSS Regeneration			6	6	0
SCI Island Manzanita				5	0
SCI Island Scrub Oak				6	0
Total Plots for 2008	0	0	8		
Total Number of Plots Installed to Date				53	24

Crater Lake National Park

Crater Lake (CRLA) is part of the Klamath-Cascades network, so the table below shows only the plot reads that our crew did. The crew made one trip to CRLA, to read plots burned in last year's Cornerstone Prescribed Burn, and also entered the data into the CRLA FFI database.

Park: Crater Lake

Monitoring Type Name	Number of Plots Read in 2008*		
	Pre-burn	Immediate Post	Postburn, (1-20 yrs)
Lodgepole Pine (various mon. types)			5
Total Plots for 2008	0	0	5

*This is the total that the PORE crew did

Golden Gate National Recreation Area

Ten-year re-reads were done for plots in several monitoring types at Golden Gate, including one redwood plot at Muir Woods. No other plots were installed or due to be read.

Park: Golden Gate

Monitoring Type Name	Number of Plots Read in 2008			Total # of Plots, by Monitoring Type	
	Pre-burn	Immediate Post	Postburn, (1-20 yrs)	Burn	Control
Northern Coastal Scrub (ARCA)				1	0
Northern Coastal Scrub (BAPI)				11	7
Manzanita Chaparral				4	0
Annual Non-native Grassland (BRDI)			3	25	3
Annual Non-native Grassland (BRDI2)				5	3
Italian Thistle			4	5	0
Eucalyptus Forest				1	0
Mustard				1	0
Northern Coastal				16	9

Prairie					
Perennial Non-native Grassland (PHAQ)			6	6	2
Perennial Non-native Grassland (FEAR)				4	0
Redwood Forest			1	9	0
Bay Woodland				4	0
Total Plots for 2008	0	0	14		
Total Number of Plots Installed to Date				92	24

Joshua Tree National Park

No trips were made to Joshua Tree this year. The park has 12 plots in one monitoring type (as shown in the table), and the ten-year read was done in 2003. No new burns or plot work are planned.

Park: Joshua Tree

Monitoring Type Name	Number of Plots Read in 2007			Total # of Plots, by Monitoring Type	
	Pre-burn	Immediate Post	Postburn, (1-20 yrs)	Burn	Control
Black Brush Scrub				10	2
Total Plots for 2008	0	0	0		
Total Number of Plots Installed to Date				12	

Lassen Volcanic National Park

Lassen, a Klamath-Cascades park, was visited only by the Lead Monitor. Accompanied by Chris Merideth from Redwood, one plot was read before and after it burned. The lead monitor also served as a FEMO for the two-day Butte Lake prescribed burn.

Park: Lassen Volcanic

Monitoring Type Name	Number of Plots Read in 2008*		
	Pre-burn	Immediate Post	Postburn, (1-20 yrs)
Ponderosa Pine		1	1
Total Plots for 2008	0	1	1

*This is the total that the PORE crew did

Lava Beds National Monument

The crew made two trips to Lava Beds, yet another Klamath-Cascades park. On the first trip, new plots were installed in the Valentine burn unit, which had been slated to burn this year. Since it was a new monitoring type (western juniper), the crew was accompanied and assisted by Paul Reeberg. On the second trip the crew read plots that had just burned in the Jack wildfire, and finished up Valentine plot work. On this short trip the crew worked with two members of the fire effects crew from Redwood National Park, Becky Smith, the Lead Monitor, and Chris Merideth, a seasonal crew member. The Central and Southern CA crew entered these data into FFI. The table below shows only the LABC plots read by the Central and Southern CA crew, either alone or jointly with the Redwood crew.

Park: Lava Beds

Monitoring Type Name	Number of Plots Read in 2008*		
	Pre-burn	Immediate Post	Postburn, (1-20 yrs)
Western Juniper	8		
Grass		5	11
Total Plots for 2008	8	5	11

*This is the total that the PORE crew did

Pinnacles National Monument

The crew made two visits to Pinnacles (the second a one-day trip), in order to install new plots in the Bottomlands prescribed burn unit, which had been slated to burn this year. The crew also assessed yellow starthistle density on plots installed last year, and read four plots burned in the 1998 Stonewall wildfire.

Park: Pinnacles

Monitoring Type Name	Number of Plots Read in 2007			Total # of Plots, by Monitoring Type
	Pre-burn	Immediate Post	Postburn, (1-20 yrs)	
Chamise Chaparral				26
Mixed Chaparral			1	28
Blue Oak Woodland			3	16
Yellow Starthistle	6			12
Total Plots for 2008	6	0	4	
Total Number of Plots Installed to Date				82

Point Reyes National Seashore

At Point Reyes, two prescribed burns were carried out, the first since 2006. In preparation for that the crew gathered a second year of pre-burn data for the native *Deschampsia* grassland plots. The Fire Ecologist accompanied us for a day of field work. After the burns the crew completed 13 immediate-post reads. The crew also continued with photomonitoring to document mechanical fuel manipulation projects. In addition, they carried out the projects mentioned in the summary above.

Park: Point Reyes

Monitoring Type Name	Number of Plots Read in 2008			Total # of Plots, by Monitoring Type	
	Pre-burn	Immediate Post	Postburn, (1-20 yrs)	Burn	Control
Non-native Annual Grassland				22	14
Non-native Perennial Grassland				4	3
Non-native Grassland with Scotch Broom				18	0
Non-native Grassland with French Broom		5		13	0
Perennial Grassland: <i>Deschampsia</i>	7	4		4	3
Northern Coastal Scrub				6	4
Bishop Pine (forest plots)				3	0
Bishop Pine (brush plots)		4		3	3
Douglas Fir				1	0
Eucalyptus				5	0
Total Plots for 2008		13			
Total Number of Plots Installed to Date				79	27

Santa Monica Mountains National Recreation Area

At SAMO the crew read 70 plots during three trips to that park. These included 10-year reads of five sagebrush plots, 3-year reads of 9 brush and 21 grass plots where 2005 Topanga wildfire had burned in Cheeseboro Canyon, and nine other 3-year old grass plots burned in the Cheeseboro '05 prescribed burn. In addition to this, the crew read 30 burn severity plots in areas burned by the fall 2007 Corral and Canyon wildfires. The traditional composite burn index (CBI) plot method is not a good fit for chaparral, with its shrub vegetation, so the SAMO Fire Ecologist is developing a new method that will more effectively capture the severity effects in shrub systems.

In addition to the data entry from this plot work (with the exception of the burn severity plots which require development of new protocols in FFI before the data can be entered), the crew completed a project to enter the seven years of data from SAMO's FORB plots into FFI. In all there were 122 reads from 16 plots. Finally, the crew also entered data from 77 CBI plots that had been read after the 2005 Topanga fire.

Park: Santa Monica Mountains

Monitoring Type Name	Number of Plots Read in 2008			Total # of Plots, by Monitoring Type	
	Pre-burn	Immediate Post	Postburn, (1-20 yrs)	Burn	Control
<i>Avena fatua</i> Non-native Annual Grassland			12	10	1
<i>Bromus diandrus</i> Non-native Annual Grassland			9	10	0
Non-native Annual Grassland (ANGR)			8	16	8
<i>Phalaris aquatica</i> Non-native Perennial Grassland				10	0
<i>Distichlis spicata</i> Native Perennial Grassland			1	1	0
<i>Nassella pulchra</i> Native Perennial Grassland				8	0
Mustard			1	0	1
Forb (non-native annuals and herbaceous)			16*	16	0

perennials)					
Sagebrush Coastal Sage Scrub			7	16	0
Laurel Sumac Coastal Sage Scrub				1	0
Chamise Chaparral				17	0
Big-pod Ceanothus Chaparral				11	0
Greenstem Ceanothus Chaparral				5	0
Hoary-Leaf Ceanothus			1	1	0
Eastwood Manzanita Chaparral				1	0
Black Sage Chaparral			1	2	0
Oak Woodland				11	1
Burn Severity			30	30	0
Total Plots for 2008	0	0	86		
Total Number of Plots Installed to Date				166	11

*The 16 Forb plots were read by SAMO staff, not by us

Management Objectives and Monitoring Results 2008

Park: Channel Islands NP

(Note: yellow indicates plots which have reached 10 year read and will be retired on this and following tables)

Monitoring Unit	Management Objective	Monitoring Results (95% CI)	Objective Achieved?
Coastal Sage Scrub (Santa Rosa Island)	Increase native shrub cover (1°)/decrease exotic species cover (2°)	10 year change ARCA cover* Control +195% (11%-+440%) Burn -17.5% (44%- -85%)	No (1°) TBD (2°)
Nassella pulchra grassland (Santa Rosa Island)	Increase native grass cover (1°)/decrease exotic species cover (2°)	PRE NAPU cover* Control 32% Burn 19% % change NAPU cover# Control 16% (-94% - +264%) Burn 19% (-75% - +306%) 10 YR NAPU Cover# Control 58% (41% - +69%) Burn 49% (4% - +80%)	No effect (1°) TBD (2°)
SCI Fennel	<p>Characterize flatland fennel areas of the Del Norte burn unit. Measure whether the burn objective to reduce fennel cover is achieved and document what type of vegetation becomes established subsequent to treatment.</p> <p>Reduce total above ground biomass, in fennel dominated areas, by 60-90% immediately following treatment</p> <p>Limit fire spread in shrub dominated areas with less then 40% relative cover of fennel.</p> <p>Less than 20% increase in cover of exotic species during the first three years following treatment</p> <p>Less than 20% decrease in cover of native grass and herbaceous species during the first three years following treatment.</p> <p>Increase the average relative</p>	Fennel Burn Cancelled	No data

	<p>cover of native shrubs by 30% during the first five years following treatment.</p> <p>Monitoring variables are cover (all species) and density (shrubs and fennel).</p>		
SCI Mixed Fennel	<p>Characterize the composition and structure of areas of intermediate slope areas (20-40%) that may be dominated by fennel or may have a significant native component.</p> <p>Measure the effect of fire in mixed fennel/CSS vegetation and document what type of vegetation becomes established subsequent to treatment.</p> <p>Reduce total above ground biomass, in fennel dominated areas, by 60-90% immediately following treatment</p> <p>Limit fire spread in shrub dominated areas with less than 40% relative cover of fennel.</p> <p>Less than 20% increase in cover of exotic species during the first three years following treatment</p> <p>Less than 20% decrease in cover of native grass and herbaceous species during the first three years following treatment.</p> <p>Increase the average relative cover of native shrubs by 30% during the first five years following treatment.</p> <p>Monitoring variables are cover (all species) and density (shrubs and fennel).</p>	Fennel Burn Cancelled	No data
SCI Mixed Coastal Sage Scrub	<p>Limit fire spread in shrub dominated areas with less than 40% relative cover of fennel.</p> <p>Less than 20% increase in cover of exotic species during the first three years following treatment</p> <p>Less than 20% decrease in cover of native grass and herbaceous species during the first three years following treatment.</p> <p>Increase the average relative cover of native shrubs by 30% during the first five years following treatment.</p> <p>Provide basic information regarding native species response to fire including % mortality, % resprouting, and degree of seedling recruitment.</p> <p>Determine if fire has a positive or negative impact on native shrub recovery.</p>	Fennel Burn Cancelled	No data

	Monitoring variables are cover (all species) and density (shrubs and fennel).		
SCI Island Manzanita	<p>Provide basic information regarding species response to fire including % mortality, % resprouting, and degree of seedling recruitment.</p> <p>Evaluate fire behavior and fire severity in this community type under the proposed fall fire prescription</p> <p>Determine the effect of fire on stand structure, particularly the unusual arborescent form.</p> <p>Monitoring variables are cover (all species), density (shrub species), and stand structure of tree forms.</p>	Fennel Burn Cancelled	No data
SCI Island Scrub Oak	<p>Provide basic information regarding native species response to fire including % mortality, % resprouting, and degree of seedling recruitment.</p> <p>Evaluate fire behavior and fire severity in this community type under the proposed fall fire prescription</p> <p>Determine the effect of fire on stand structure, particularly the unusual arborescent form.</p> <p>Monitoring variables are cover (all species), density (shrub species), and stand structure of tree forms.</p>	Fennel Burn Cancelled	No data
SCI CSS Regeneration (Cruz Fire)	<p>Document postfire recovery of native shrubs and the herbaceous flora within island CSS stands.</p> <p>Quantify the relative degree of resprouting and seeding for shrub species in island CSS.</p> <p>Quantify pre-burn shrub density, postburn species diversity, cover and resprout/seedling density in burned island CSS.</p> <p>Is regeneration adequate to replace the pre-existing CSS vegetation?</p> <p>Is there invasion by non-native species, particularly non-native grasses and fennel?</p> <p>Does fennel spread into burned areas from seed?</p> <p>Are fragmented or small stands of CSS less likely to recover than previously closed canopy stands?</p> <p>How does environmental variation, such as the record low rainfall in the 2006 water year, affect</p>	Pending FFI conversion (new plot type)	2008

	regeneration? Monitoring variables are cover (all species), density (shrubs), % resprouting (fennel and shrubs) in a nested plot design.		
SCI Fennel Regeneration (Cruz Fire)	Quantify postfire fennel recovery in non-native annual grassland. Monitoring variables are cover (all species), density (fennel), % resprouting (fennel).	Pending YR2 data	2008

* Indicates that results are statistically significant at $\alpha = 0.05$

Indicates that results are not statistically significant at $\alpha = 0.05$

Discussion

Fire was a detriment to Coastal Sage Scrub recovery after the Ranch prescribed burn on Santa Rosa Island. After ten years in unburned transects, cover of the dominant shrub, *Artemisia californica*, increased an average of 195%, from 19% to 42%. In the burned transects the cover decreased an average of -18% from 35% to 27%. There was no significant change in ARCA density in the control plots so the increase in cover can be attributed to an increase in the average size of the plants over ten years. In the burned plots ARCA density decreased an average of -41% from 58% to 33%. The new SCI CSS Regeneration plots were installed to see if the results of the Ranch prescribed burn are repeated in this recent wildfire. The plot design will allow us to determine the mechanism of regeneration success or failure.

After ten years there was no difference in the amount of *Nassella* cover as measured along a point intercept transect in burned versus control plots. The initial *Nassella* cover of the control plots was significantly greater than that of the burn plots, but there was no difference in the percent increase between burn and control plots or in the total cover at the end of ten years. Although there was no significant difference in the final amount of cover between the plot types after ten years, the variance in the control plots was much lower than in the burn plots (i.e. the range of cover values for the control plots was 41% - 69%, but the range for burned plots was 4% - 80%). The point intercept transect provides a poor measure of *Nassella* cover. We have found that basal area is a much better indicator of cover for a perennial bunchgrass such as *Nassella*.

Additional analysis is required to see whether burning caused an increase in non-native cover after ten years in either plot type.

Park: Golden Gate NRA

Monitoring Unit	Management Objective	Monitoring Results (90% CI)	Objective Achieved?
Redwood Forest	Reduce fuel loading (1°)/Restore natural fire regimes(2°)	1°: No significant difference in fuel loading between PRE and YR10* 2°:N/A – objective too vague (n=8)	1°: No 2°: N/A

* Fuel loading did decrease significantly in YR01, but by YR02 it had returned to pre-fire levels. However, the results in this situation are confounded by an outbreak of Sudden Oak Death which has killed most of the tanoak in Muir Woods National Monument, where the plots are, and has thus lead to additional fuel loading.

Park: Pinnacles NM

Monitoring Unit	Management Objective	Monitoring Results (90% CI)	Objective Achieved?
Chamise Chaparral	Enhance native plants*	-30% to +21% change in native species absolute cover# (n=7)	No

Indicates that results are not statistically significant at $\alpha = 0.1$

* This was not the original burn objective. The original goal was to create a discontinuity in the fuels along the boundary without type converting the area to grass. This objective is no longer considered valid.

Park: Point Reyes NS

Monitoring Unit	Management Objective	Monitoring Results (90% CI)	Objective Achieved?
Non-native Annual Grassland: D Ranch	Increase cover of Bromus carinatus (1°)/Increase cover of native species (2°)	1°: No significant difference between seeded and unseeded plots in absolute % cover BRCA 2°: Burn plots had an 11% increase in natives versus a 2% increase for control plots (n=6 burn plots; n=3 control plots)	1°: No 2°: Yes
Non-native Perennial Grassland	Decrease cover of BAPI(1°)/Maintain or decrease cover of PHAQ(2°)/Maintain or increase cover of native spp. (3°)	1°: 10±3% decrease in absolute cover BAPI for burn plots versus 5± 2% increase in absolute cover BAPI for control plots 2°: No difference in absolute % cover PHAQ between treatment and control	1°: Yes 2°: Yes 3°: No

		3 ^o : 13±5% decrease in natives for burn plots versus 11± 3% increase in natives for control plots (n=4 burn plots; n=3 control plots)	
Eucalyptus	To decrease the standing BA of eucalyptus(1 ^o)/To decrease dead and downed fuel loading at the site(2 ^o)/To minimize eucalyptus resprouting(3 ^o)/To maintain GEMO2 density at or below pre-treatment levels(4 ^o)	1 ^o : 811-4315 cm ² reduction in basal area of eucalyptus 2 ^o : No statistically significant change in fuel loading 3 ^o : 0-22% rate of resprouting 4 ^o : -.2 - 22 stems/m ² reduction in GEMO2 density [#] (n=4)	1 ^o : Yes 2 ^o : No 3 ^o : Yes 4 ^o : Unknown: sample size is too small.
French Broom	French broom reduction(1 ^o)/native plant enhancement(2 ^o)	1 ^o : 35-103% Reduction in absolute cover of French broom 2 ^o : 0-11% Reduction in native species [#] (n=11)	1 ^o : Yes 2 ^o : No

Indicates that results are not statistically significant at $\alpha = 0.1$

Park: Santa Monica Mountains NRA

Monitoring Unit	Management Objective	Monitoring Results (95% CI)	Objective Achieved?	N Burn	N Control
<i>Avena fatua</i> Non-native Annual Grassland	Quantify the effects of different fire return intervals and environmental variability on annual grassland composition ¹	Field work completed 2008		10	1
<i>Bromus diandrus</i> Non-native Annual Grassland	Quantify the effects of different fire return intervals and environmental variability on annual grassland composition ¹	Field work completed 2008		10	0
Non-native Annual Grassland (ANGR)	1) Reduce biomass annually without 2) increasing non-native forb cover	PRE for 2009 mow treatment.	1) Yes 2) Ongoing	6	4
<i>Phalaris aquatica</i> Non-native Perennial Grassland	Eliminate PHAQ (mow and spray)	Completed 2007	YES	10 mowed	0

<i>Distichlis spicata</i> Native Perennial Grassland	Maintain or increase DISP cover	PRE for 2009 mow treatment	Ongoing	1	0
<i>Nassella pulchra</i> Native Perennial Grassland	Quantify population response to fire; evaluate utility of fire for native grassland restoration ¹	Point transect inappropriate method. Data from Topanga Fire survey	Relatively low fire mortality unless drought stressed; significant decrease live biomass; flowering stimulated but net production reduced by lower total postfire biomass; increase cover non-natives; time to recover to pre- fire pending analysis 2008 data	8	0
Mustard	Quantify the effects of different fire return intervals and environmental variability on annual grassland composition ¹	Completed 2008	TBD	0	1
FORB (non-native annuals and herbaceous perennials)	Quantify the effects of fire and restoration treatments on annual grassland composition	Data Entered Ongoing	TBD	12	0
Sagebrush Coastal Sage Scrub	Prefire shrub cover is restored by 5 years at coastal sites and 10 years at inland sites; herb cover in YR1 and YR2 is predominately native ²	Coastal completed Inland ongoing	YES coastal TBD inland	16	0
Laurel Sumac Coastal Sage Scrub	Legacy data		NA	1	0
Chamise Chaparral	Determine if short fire interval reduced native chaparral shrub cover; increased CSS shrub cover or increased non- native herb cover ³	Pending additional field sampling based on revised fire history map developed from BARC burn severity imagery	TBD	17	0
Big-pod Ceanothus Chaparral	Legacy data ⁴		NA	11	0
Greenstem Ceanothus	Legacy data ³		NA	5	0

Chaparral					
Hoary-Leaf Ceanothus	Determine if short fire interval reduced native chaparral shrub cover; increased CSS shrub cover or increased non-native herb cover ³	Pending additional field sampling based on revised fire history map developed from BARC burn severity imagery	TBD	1	0
Eastwood Manzanita Chaparral	Legacy data		NA	1	0
Black Sage Chaparral***	Determine if short fire interval reduced native chaparral shrub cover; increased CSS shrub cover or increased non-native herb cover ³	Pending additional field sampling based on revised fire history map developed from BARC burn severity imagery	TBD	2	0
Oak Woodland	Hazard fuel reduction; enhance growth of oak seedlings by decreasing relative cover of non-native annual grasses and litter depth ⁵ Determine 10 year QUAG growth rates; determine if associated postfire herb flora is still present.	Completed 2007	NO (original) TBD (revised)	11	1

¹ These were not the original burn objectives. The original goals were hazard fuel reduction; reduce the cover of BRNI and limit its spread. Hazard fuel reduction will last for one year only in an annual grassland. Fire increases BRNI cover in the first years following fire. These objectives are no longer considered valid.

² This was not the original burn objective. The original goal was hazard fuel reduction. This objective is no longer considered valid.

³ These were not the original burn objectives. The original goals were hazard fuel reduction; improve habitat by creating a mosaic of vegetation age classes. These objectives are no longer considered valid.

⁴ These were not the original burn objectives. The original goals were hazard fuel reduction; improve habitat by creating a mosaic of vegetation age classes; and rejuvenate decadent stands of brush over 35 years old. These objectives are no longer considered valid.

⁵ These are the original burn objectives. These objective are no longer considered relevant based on data regarding fire behavior and QUAG post fire demography.

** Data needs to be entered into FFI.

*** needs to be reclassified with Chamise chaparral plots (Chamise -black sage vegetation type) after FFI conversion.

Fire Ecology Staffing 2008

Monitor	Starting Date	Ending Date	# of Pay Periods	Training and Development
Alison Forrestel	n/a	n/a	26	FFI training, Point Reyes Leadership Academy, CNPS Vegetation Mapping Class, S212
Marti Witter	n/a	n/a	26	FFI training
Wende Rehlaender	2-10-08	12-31-08	23.5	FFI training; M-580; attended Association for Fire Ecology conference
Daniel Landgrebe	3-30-08	10-11-08	14	
Matthew Lee	3-30-08	10-11-08	14	S-290

Accomplishments and Focus Areas for Fire Ecologists and Fire Effects Monitors

Bay Area Fire Ecologist

Category	% Time	Accomplishments/Focus Area
General Planning	15%	<ul style="list-style-type: none"> Assisted with planning and project review for PORE fuels projects Updated PORE Resource Advisor Maps Worked with PINN on planning for proposed new lands burn Initiated GOGA 5 year plan
Presentations and Other Outreach	15%	<ul style="list-style-type: none"> Organized and presented data at the 3rd Annual Fire Effects Forum for PORE & GOGA Coordinated brownbag on <i>Spatial Distribution and Impacts of Phytophthora ramorum and Sudden Oak Death in Point Reyes National Seashore</i>. March 26, 2008. <i>Fire in Coastal Redwood Forests: Managing in an Era of Uncertainty</i>. Presented at NPS PWR Natural Resources Management Meeting. April 23, 2008. New fire ecology web pages on PORE website Assisted with production of Sudden Oak Death educational video production and content

NPS Meetings / Task Groups	10%	<ul style="list-style-type: none"> Facilitated regular meetings/fieldtrips for PORE fire & resource management staff Initiated regular meeting for GOGA fire & resource management staff
Fire Assignments and Fuels Projects	2%	<ul style="list-style-type: none"> GISS on Lime Complex, SNF
Research	5%	<ul style="list-style-type: none"> Completed final report on Sudden Oak Death and fire. Research was conducted by UC Berkeley through the CA CESU: Moritz, M., T. Moody, B. Ramage, and A. Forrestel. 2008. <i>Spatial Distribution and Impacts of Phytophthora ramorum and Sudden Oak Death in Point Reyes National Seashore</i>. Collected tanoak acorns so that Point Reyes populations could be included in a UC Berkeley/USFS study on the genetic diversity in resistance to Sudden Oak Death. Secured NPS regional funding for work on SOD treatment with AgriFos
Monitoring Field Work	1%	<ul style="list-style-type: none"> Assisted with field work at PORE
Data Management and Conversion	5%	<ul style="list-style-type: none"> FEAT to FFI data conversion
Data Analysis	5%	<ul style="list-style-type: none"> Completed analysis of vegetation change following the Vision Fire
Supervision/Admin	25%	<ul style="list-style-type: none"> Supervised lead monitor Travel & time paperwork Administered CESU agreement with UC Berkeley
Training & Professional Development	12%	<ul style="list-style-type: none"> Fire refresher Point Reyes Leadership Academy FFI Training CNPS Vegetation Mapping Course S212 - Saws
Miscellaneous	5%	<ul style="list-style-type: none"> Coordinated Scotch broom mapping effort in preparation for upcoming broom reduction burns

Mediterranean Coast Fire Ecologist

Category	Accomplishments/Focus Area
General Planning and Fire Management Program Support	<ul style="list-style-type: none"> Coordinated between GIS staff and Fire Management staff to complete and implement the use of the comprehensive database of the 1,966 private properties within 200' of the NPS property boundaries for the park's defensible space fuel management program. Prepared PEPC compliance for park defensible space and strategic fuel modification projects. The Cat Ex for the annual defensible space was approved for renewed and the annual strategic fuel modification projects were approved as a Cat Ex. Developed park decision tree to determine appropriate park fuel modification treatments on NPS property adjacent to developed properties (Draft under Superintendent review). Attended weekly meetings between Fire Management and PSRM to support fuels/community education programs. Initiated the SMM's Resource Agencies Wildfire Suppression Mitigation Working Group Prepared or assisted in preparation of cooperative agreements for assessment of structure susceptibility to wildfire at CABR National Monument (CESU, UC Berkeley) and for defensible space fuel modification projects (MRCA). A third cooperative agreement with UC Berkeley for a Santa Ana wind study was not funded. Contributed significant revisions to the parks' first CWPP (Hillside Drive, Topanga) and prepared PEPC compliance documents that were approved in November. Project has since been funded and the first phase of tree removal implemented.
Monitoring Plans	<ul style="list-style-type: none"> Coordinated with I&M program to develop protocols for postfire vegetation monitoring (draft)
Presentations	<ul style="list-style-type: none"> Witter, M.S. 2008. <i>Integrating Burned Area Emergency Response actions to Fire Management and Natural Resource Protection Programs at SAMO</i>. Natural Resource Program Managers Workshop, Pacific West Region, April 21-24, 2008
NPS Meetings / Task Groups	<ul style="list-style-type: none"> SAMO fire management meetings for fuels project planning Corral Fire BAER organization and progress meetings Environmental Review Team as project representative and as occasional PSRM representative.
Fire Assignments and Fuels Projects	<ul style="list-style-type: none"> None
Research/ Co-operative Projects/Park Projects	<p>CORRAL BAER/BAR</p> <ul style="list-style-type: none"> Coordinated the year-long implementation of the \$609,135 Corral Fire BAER Plan. The plan supported hiring a law enforcement ranger for the burn area, channel clearing and culvert clean-out, emergency fencing and signage, public information regarding closures and hazards, removal of burned structural debris, clearing of road and trail debris, cultural resource damage and mitigation assessment, debris removal from roads and trails and non-native invasive species control. Prepared the Corral BAR Plan requesting an additional \$402,499 for

two additional years of trail maintenance and invasive species control.

- Established monitoring plots for treatment effectiveness of weed control on fire suppression bulldozer line

TOPANGA BAR

- Coordinated with the MRT to continue the weed eradication and plant restoration activities in Cheeseboro Canyon. The final phase of the project, drill seeding of 26 acres of valley oak savanna was completed in December 2008.
- Supervised the 3-person BAR crew in implementation of the weed eradication and native plant rehabilitation.
- BAR fence removal project was completed under supervision of Fire Management staff

FIRE EFFECTS MONITORING

SAMO Fire Ecology Program

- Established Corral and Canyon Fire postfire burn severity rapid assessment plots (69 plots).
- Established plots to assess the impacts of fire history (frequency and return interval) on postfire recovery in chaparral and CSS (30 modified Whittaker metaplots and 41 seedling plots).
- Preparation of cooperative agreement for field monitoring and statistical analysis of the backlog of FFI data and development of new protocols in FFI (MRT).
- Under the supervision of Robert Taylor, Fire GIS specialist, BRD funded the re-sampling of historic VTM plots in the SMMs. Field re-sampling of historic plots was completed this year. In conjunction with GIS analysis of vegetation community shifts between that mapped in 1937 and 2000-2008, these data provide the opportunity to document the scope of fire-mediated vegetation shifts in the past seventy years.

Other Ongoing Park Projects

- Long-term monitoring of postfire effects in *Quercus lobata* sapling oaks.

INTERN PROJECTS

- Wendy Su (Bren School of Environmental Science and Management, UCSB). Rapid assessment of NPS-USGS burn severity maps of chaparral and coastal sage scrub
- Christopher Bowman (CSUN). Postfire demography of an endangered plant species, *Astragalus brauntonii*.

SUPPORT FOR MEDN FIRE ECOLOGY RESEARCH/UNIVERSITY COLLABORATION

- Stephen Davis (Pepperdine University), Anna Jacobsen and Brandon Pratt (CSU Bakersfield). Their research was completed and the final report submitted (9/30/2008) on the impact of drought on post fire recovery in resprouting chaparral species funded with \$25,000 in NPS fire research funds. Project title: *Mechanisms and Effects of Resprout Failure on Post-fire Chaparral Regeneration*. Funded in 2007, this 2 year project was completed in 2008. An additional \$16,000 from PSRM provided additional student support in the summer 2008 to continue additional research on this project. Funds are in place to continue undergraduate student research in 2009. The results of this and earlier NPS funded research were presented by Anna Jacobsen and Brandon

	<p>Pratt at the 2008 CAFE conference.</p> <ul style="list-style-type: none"> • James Hayes (Department of Geography, CSUN). MS thesis student project collaborating on GIS analysis of NPS burn severity data with Topanga, Corral and Canyon BARC and field data. • James Hayes (Department of Geography, CSUN). MS student project to resample 1998 valley oak demographic data and establish new long-term monitoring plots. • Julie Christian (U. Wisconsin). MS student will incorporate FFI data from CHIS Santa Rosa Island prescribed burn plots with 2007-2008 field work to examine native shrub recruitment and recovery. • Travis Brooks (Department of Ecology and Evolutionary Biology, UCLA). Met to discuss the potential of Cheeseboro canyon as a potential replicate site for distributional controls on <i>Nassella pulchra</i> and <i>Quercus lobata</i> using postfire plots established after the Topanga fire. • Paul Laris (Department of Geography, CSULB). Graduate student summer research project of the historic record to determine vegetation changes associated with grazing practices in the Simi Hills and SMM's. • Bren School (UCSB). Solicited a group project proposal: <i>Assessing Fire Regime Change in the Santa Monica Mountains under Climate Change Scenarios: Policy and Management Implications</i>. The objective is to integrate information on critical SMM's wildfire variables including 1) geographic variability of Santa Ana winds based on USFS wind models; predicted changes in live fuel moisture based on expected changes in the climate parameters of precipitation and temperature; and geographic variability in chaparral twig and stem dieback. Decision pending. <p>PROPOSALS</p> <ul style="list-style-type: none"> • 2008 proposal to NPS NRPP. <i>Brassica nigra</i> as an indicator of ecosystem disturbance and vulnerability. Unfunded. • 2008 proposal to National Parks Foundation Small Grants Under \$10,000 <i>Valley Oak on the edge: the impact of central California genes on the southern most population, SMMNRA, California</i>. Submitted with Dr Mary Ashley, University of Illinois, Chicago. Unfunded. • 2008 proposal to Wildlife Conservation Board Habitat Enhancement and Restoration Program - Endangered Species Habitat. <i>The Santa Monica Mountains National Recreation Area's Early Detection and Rapid Response Project</i>. Unfunded. • 2008 proposal to PWR fuels management program. Mapping patterns of extreme fire weather as guidance for fire management in the Santa Monica Mountains National Recreation Area. Unfunded.
<p>Technical Assistance</p>	<ul style="list-style-type: none"> • Native Seed Development for Southern California Ecoregions. Riverside Corona RCD, Riverside January 23, 2007. Workshop. • Santa Monica Mountains Fire Safe Alliance • Bioblitz: Posters 1) Santa Monica Mountains Wildfires, 2) Biodiversity and Fire and student field demonstrations • Corral BAR temporary wayside posters • <i>Ceanothus verrucosus</i> Population Viability Analysis Model Workshop, Cabrillo National Monument, 2/13/08.

	<ul style="list-style-type: none"> • Peer review for BRD/USGS/DOI manuscript (Keeley and Zedler) • Tenure recommendation for Max Moritz, Cooperative Extension Specialist/Adjunct Professor, College of Natural Resources, UC Berkeley
Monitoring Field Work	<p><i>PORE Fire Effects Crew.</i></p> <ul style="list-style-type: none"> • The PORE fire effects crew re-read CSS plots on Santa Cruz Island to monitor recovery from the small 2006 summer wildfire on Nature Conservancy property. • The PORE fire effects crew did YR3 measurements of the shrub and grassland plots that burned in the Topanga Fire, YR 10 measurements of coastal CSS prescribed burn plots, and re-reads of the grassland strategic mow plots in Cheeseboro. • PORE crew assisted in the Coral and Canyon Fires burn severity rapid assessment plots. • The Fire Effects crew entered backlogged SAMO prescribed burn/mechanical mowing grassland (FORB) plots into FFI.
Data Entry	Fire effects monitors completed all data entry.
Data Management and Conversion	<ul style="list-style-type: none"> • Copies of all FMH/FEAT data sheets/plot photos have been scanned and are in digital format and were distributed to PORE and CHIS. CHIS hard copy data sheets and slides were located and re-organized and returned to CHIS for permanent archiving. 2008 photos and data have been added to the digital archive and will continue to be updated annually. • FFI data on local computers. Working with the SAMO database manager to place the FFI software on a park server so that it can be remotely accessed by CHIS or PORE
Data Analysis	Data analysis for projects, publications, presentations, and annual reports.
Supervision/Admin	<ul style="list-style-type: none"> • Administered Topanga BAR project and supervised three biotechnicians • Coordinator Corral BAER project
Publications	<ul style="list-style-type: none"> • Orrock, John, M. Witter and O. J. Reichman. 2009. <i>Native consumers and seed limitation constrain the restoration of a native perennial grass in exotic habitats</i>. Restoration Ecology. Restoration Ecology, 17(1), pp. 148–157. See Attachments – Cover illustration • Orrock, John, M. Witter and O. J. Reichman. 2008. <i>Native consumers and biological invasion maintained via apparent competition</i>. Ecology, 89(4), pp. 1168–1174 • Orrock, J. L. and M. S. Witter. 2008. <i>Multiple consumer-mediated indirect effects reduce re-establishment of a native plant</i>. Submitted Ecological Applications. • Witter, M.S., Kendra Sikes, Jennifer Carlson, Joseph Algiers. 2008. <i>Impact of fire and subsequent drought on a native California bunchgrass, <u>Nassella pulchra</u></i>. California Association for Fire Ecology. Abstract. • Witter, M.S., Tarja Sagar, Wendy Su, Robert S Taylor. 2008. <i>Rapid assessment of NPS-USGS burn severity maps of chaparral and</i>

coastal sage scrub burned in two southern California wildfires.
California Association for Fire Ecology. Abstract.

- Witter, M.S., Joseph Algiers, Jennifer Carlson. 2008. *Effects of repeated fire on valley oak (Quercus lobata) saplings in the Santa Monica Mountains National Recreation Area.* California Association for Fire Ecology. Abstract.
- Witter, M.S. 2008. *Fire management in the Mediterranean Coast Network: trying to fit a square peg into a round hole.* George Wright Society Biennial Meeting March 2009. Abstract.

Fire Effects Crew

Category	Percent Time		Accomplishments/Focus Area
	Crew	Lead	
FMH Plots	40%	18%	Includes 13 travel days per person to away parks (11 for lead)
Other Projects	9%	<1%	<ul style="list-style-type: none"> • Ground-truthed vegetation map for Scotch broom (3 days) • Collected tanoak acorns as part of a SOD research project at UC Berkeley (3 days) • Pulled broom (one day) • Assisted with wetlands restoration project (3 days) • GPS'd burn units and mowed areas at PORE; downloaded to GIS
Fire Assignments	1%	3%	<ul style="list-style-type: none"> • Lead Monitor was FEMO on two prescribed burns at PORE • Seasonals participated in two PORE prescribed burns • Lead Monitor was FEMO on prescribed burn at LAVO (2 days plus 2 travel days) • Lead Monitor provided training assistance for three FEMO trainees • Wrote burn reports
Data Entry, Slide & Photo Labeling, Keying Vouchers, and Miscellaneous Office Work	33%	22%	And for Lead only: work on FFI to clean up species code lists
Supervision and Administration	0%	40%	Hiring, planning, timesheets, travel, and other paperwork, evaluations, preparing for trips, ordering things, annual report, and various other administrative tasks
Meetings	<1%	3%	
Training and Development	9%	10%	Fire refresher, training and development as noted in previous table, regular PT
Orientation and Informal Training	7%	4%	Learning and teaching

Attachments

Orrock, John, M. Witter and O. J. Reichman. 2009. *Native consumers and seed limitation constrain the restoration of a native perennial grass in exotic habitats*. *Restoration Ecology*. *Restoration Ecology*, 17(1), pp. 148–157. Cover Illustration (see below).

