National Park Service
CENTRAL AND SOUTHERN CALIFORNIA
Fire Ecology Annual Report
Calendar Year 2007

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

Calendar year 2007 was a busy one for the Southern and Central California Fire Ecology and Fire Effects Program. Highlights from the year include a record number of plots completed by the Fire Effects Crew, the completion of several key documents for the Bay Area Network Fire Ecologist, and three wildland fires in the Southern California parks.

The Fire Effects Crew spent an unprecedented amount of time travelling during the 2007 season, including six trips to do field work and three fire assignments. The crew was able to complete a large number of plots (190 FMH plots and 90 CBI plots) across six National Park Service units. The plot load was particularly large this year in part because the Fire Effects Crew provided assistance with field work to the Klamath-Cascades network for the third consecutive year.

The Bay Area Network Fire Ecologist focused on completing several key reports and planning documents including the Point Reyes National Seashore (PORE) Resource Advisor (READ) Guide and Kit and the PORE Fire Effects Monitoring Plan. The Bay Area Network Fire Ecologist also assisted with the completion of Fire Management Plans for all of the network

parks. In addition, she hosted the second annual Fire Effects Forum, assisted the national Fire Ecology program with training for the FEAT GIS Module, completed a fire assignment to the Tin Cup Fire (MT), and securing funded for Sudden Oak Death research and management. Another significant event of 2007 was that the Fire Ecologist started a PhD program in fire ecology on a part time basis at UC Berkeley.

In Southern California the most significant events this year were the October firestorm and the record drought. In the Santa Monica Mountains National Recreation Area (SAMO) there were three wildfires, the Malibu (1/8/07), the Canyon (10/21/07) and the Corral (11/24/07) which together caused more than $175,000,000 in property damage. The Corral Fire burned the NPS's Solstice Canyon unit with losses that included a staff residence, dorm, Research Learning Center science building and two other historic structures.

For the Mediterranean Coast Network, this year's fires emphasized that effective fire management cannot depend on fuels management alone. Effective fire management also requires actions to minimize ignitions and assure better structural protection. Such actions will also help to prevent degradation of our natural resources from frequent fires and reduce inappropriate vegetation management actions both before and during fires. These regional needs are increasingly recognized by agencies and news media. After the October southern California firestorm some truly effective fire strategies were proposed, such as placing utilities underground in high fire hazard areas. One of our most pressing needs is to better understand factors contributing to structure loss and survival. This is where we believe the most effective protection can be obtained with minimum impact to natural resources. Unfortunately, we did not have the opportunity to study these factors in the Corral, Canyon and Malibu fires because of the lack of fire personnel to analyze the relationship of fire behavior, operational tactics and structure ignition and spread.

Our highest priorities for support from the regional office to meet integrated fire management and resource protection goals are:

1) Provide staff to conduct an after-the-fact analysis of contributing factors to structure loss and structure survival in the Corral, Canyon and Malibu fires. Provide a mechanism to perfom immediate postfire survey and analysis after future fires.
2) Provide funding for modeling the geographic variability of Santa Ana wind intensities in the SMM's. Such information will be used for prioritizing locations for undergrounding utility lines; developing operational tactics for use during wildfires; refining hazard maps for planning purposes; and alerting homeowners in especially high wind hazard areas.

The Southern California Fire Ecologist coordinated preparation of the Corral Fire Burned Area Emergency Rehabilitation (BAER) Plan to assist with needs for increased law enforcement, public information, weed control, cultural resource protection, debris removal and trail repair. Other work during the year included supervising work for YR2 of the Topanga Fire Burned Area Rehabilitation (BAR) project; coordinating fire effects monitoring; digitizing all FMH/FEAT data sheets and photographs; collaboration with the Fire Management Officer on strategic fuels project planning including compliance documentation; and securing funding for research on the mechanism and impact of drought on postfire resprout recovery. High priorities for 2008 include coordinating implementation of the Corral BAER project; completion of the Topanga BAR project; completion of the Mediterranean Coast Network Monitoring Plan based on monitoring results from the 2005 Topanga Fire and those proposed for the 2007 Corral Fire; upgrade to FFI from FEAT and complete data analysis of all "legacy" FMH plots.

Details of Activities

Fire Effects Crew

The Central and Southern California Fire Effects Crew had an intensive plot load and travel schedule in 2007. They began their field season a month earlier than usual, with the seasonal crew members starting April 1, in order to better coordinate with the growing season for the southern parks. They started the season with training at PORE and a short trip to Pinnacles National Monument (PINN) and then made two trips to Channel Islands National Park (CHIS). The forty plots on Santa Rosa Island were done over one 14-day trip, which was followed by a trip to Santa Cruz Island, to install plots in the Cruz Fire. The crew was short one seasonal for both CHIS trips, but was able to successfully complete all of the work. At SAMO, the full crew read Topanga Fire plots and 10-year-old sagebrush plots in Zuma Canyon. Two of the Zuma plots had **no** exotic species either on the transect or within five meters, which was quite exciting. In July and August the crew traveled to Crater Lake National Park (CRLA) to work in the 2006 Bybee Fire, which was that park's largest fire-use fire to date. The Bay Area Network Fire Ecologist accompanied the Fire Effects Crew on the first trip, and was a big help. The second CRLA trip was cut short by a few days because the Klamath-Cascades Fire Ecologist, responding to a dire need for Fire Monitors (FEMO's), dispatched the Fire Effects Crew to a wildfire in Montana. The seasonals had just opened their FEMO task books, and were able to begin their training. In September, the crew was asked to come back to Crater Lake, to monitor the Cornerstone Prescribed Burn because the local Fire Effects Monitoring Crew (based out of Redwood National Park) was not available. This burn was a large timber burn, and was a great opportunity for the crew, because it was a different size and fuel type than occurs at the Central and Southern California parks. The crew ended the season with an opportunity to go to Yosemite National Park for a burn. The burn was postponed, but they worked with PORE and Golden Gate National Recreation Area (GOGA) fire staff to prepare the control lines.

At the end of the field season, the Lead Monitor moved her work space from the remote North District Office to the GIS Annex at the Bear Valley Headquarters. She will remain at this workspace through the winter and summer workspace will be determined in the spring of 2008.

Bay Area Network Fire Ecology

Reports

The year 2007 was a productive one for the Bay Area Network Fire Ecology program. The Fire Ecologist was able to complete some key reports including the PORE READ Guide. The READ Guide provides a narrative of the fire ecology and natural resource issues at Point Reyes as they pertain to fire. The guide is intended as an aid to Seashore staff and Resource Advisors in the event of a wildfire at Point Reyes NS. It is part of a larger READ kit put together by the Fire Ecologist which contains a set of maps of sensitive resources within the Seashore as well as other information that would be useful in the case of a wildfire or other emergency. The kit was put to use shortly after its completion in the Cusco Busan Oil Spill response.

The Fire Ecologist also completed the PORE Fire Effects Monitoring and Research Plan in 2007. This plan will be appended to the Point Reyes NS Fire Management Plan in the January 2008 plan update. It reviews fire ecology of the Seashore, details fire effects monitoring protocols, and lays out monitoring and research plans for the future.

Additionally, the Fire Ecologist worked with the Fire Planner to manage a contract with San Francisco State University to draft guidelines for the management of Marin manzanita. This was a unique collaboration between the Seashore, local academics, and local resource managers with expertise in maritime chaparral. The collaboration culminated in a productive day-long manzanita workshop and a report which detailed the ecology and taxonomy of Marin manzanita as well as provided management recommendations for the species and suggestions for future research.

Finally, the fire ecologist contributed to the fire management plans for Point Reyes National Seashore, Golden Gate National Recreation Area and Pinnacles National Monument.

Presentations
The Fire Ecologist presented information on the Point Reyes NS Fire Ecology and Fire Effects Program in a number of different settings. She organized and presented data to fire and natural resource managers the 2nd Annual Fire Effects Forum for PORE & GOGA. She also gave presentations at the San Domenico Women in Sciences conference, the Point Reyes SOD workshop, the State Parks Conference, the NPS Pacific West Region Fire Ecology meeting, and for Sonoma State University. The Fire Ecologist also continued to provide training to regional fire ecology staff on the Fire Effects Assessment Tool and conducted two internet training sessions and one live training. She also conducted a GPS training for the fuels and engine crews of the Bay Area Network Parks in conjunction with the Network Fire GIS Specialist.

Grants
The Fire Ecology and Fire Effects program was able to secure several grants for Sudden Oak Death work including funds for the treatment of high value trees with AgriFos and funds to develop a public information and outreach program for the disease. The field work was also completed for an ongoing project to quantify the effects of Sudden Oak Death on forest composition, structure and fuel loading.

Education
The Fire Ecologist started a PhD program in the Stephens and Moritz labs at UC Berkeley in the fall of 2007. 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 anticipates beginning her field work at Crater Lake National Park on a part-time basis during the summer of 2008.

Mediterranean Coast Network Fire Ecology

As a result of the 2007 fires, the LA County Fire Department has initiated the process to establish a Santa Monica Mountains-wide Firesafe Alliance that would act as an umbrella organization to facilitate community fuels projects, community fire education, and consistency in fuel management standards. NPS is an invaluable partner to this group because of the knowledge base and analytical capabilities we can provide. This year the Fire Ecologist initiated a comprehensive database of all private properties along NPS property boundaries for the park's defensible space fuel management program. In addition she worked on developing priorities for strategic fuels proposals with the park FMO, prescribed fire specialist, and fire GIS specialist and assisted in preparing the compliance documentation for the park's fuels projects.

Another result of the 2007 fires is the need for post-fire vegetation response monitoring in 2008. The Fire Monitoring Plan will be developed in the coming year based on results of data collected from 2005 Topanga Fire and data needs for the 2007 fires.

The Fire Ecologist gave presentations to graduate classes at CSU Northridge and UC Santa Barbara, and had work presented at several conferences. Work on grassland restoration research and fire ecology was published this year. The Fire Ecologist also supervised two fire ecology interns and secured $25,000 in NPS fire research funds to investigate the impact of drought on post fire recovery in resprouting chaparral species with Stephen Davis at Pepperdine University.

The PORE fire effects crew completed the final 10-year read of Santa Rosa Island Old Ranch Burn plots in coastal sage and *Nassella*. There was a small summer wildfire on Nature Conservancy property on Santa Cruz Island that allowed the PORE fire effects crew to set up new plots to monitor coastal sage scrub (CSS) recovery and the potential for postfire fennel recruitment into CSS. The remainder of the fire effects crew work at SAMO was YR02 measurements of the shrub and grassland plots that burned in the Topanga Fire and the PRE measurements for a planned 2008 grassland mow treatment. The Fire Ecologist had the fire ecology intern scan all FMH/FEAT plot photos and data sheets to digital format.

The Fire Ecologist coordinated preparation of the Corral Fire BAER plan, with the invaluable help of Nelson Siefkin, and also continued to manage the Topanga BAR project (YR 2).

Fire Effects Plot Workload 2007

Channel Islands National Park

On Santa Rosa Island the crew did the final ten-year re-read of forty coastal sage scrub and coastal grassland fire effects plots, including controls. Two of the ARCA plots are also CHIS vegetation monitoring plots, and were read by CHIS staff; they also helped read a third plot. The crew is indebted to CHIS staff for driving them on the rougher roads, where the crew was not permitted to drive. CHIS BRD also provided a volunteer assistant for several days, since the crew was short by one person.

On Santa Cruz Island, the crew installed new plots in patches of coastal sage scrub vegetation within last fall’s 12-acre Cruz wildfire, in order to monitor shrub recovery after the fire. Instead of being typical FHM brush line transects, the plots used a nested 10 x 10 m plot design. Two additional belt transect plots were installed in exotic grassland dominated by fennel. These were read with a percent cover method. The objective of these plots is to monitor the regeneration of fennel after fire. Below is a table of the plots installed to date in the different monitoring types.

The Lead Monitor found a native grass species on Santa Rosa previously unknown to the island (*Danthonia californica*), and was invited back to help map the grass. She also helped with a few other projects while she was there. It remains to be determined whether this grass species is an original member of the island’s flora.

Park: Channel Islands

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
SRI Coastal Sage Scrub (*Artemisia*)			21	7	14
SRI Coastal Grassland (*Nassella*)			19	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 2007	**0**	**0**	**48**		
Total Number of Plots Installed to Date				**53**	**24**

Crater Lake National Park
Although Crater Lake (CRLA) is in the Klamath-Cascades Fire Effects Network, our crew has been helping this busy network during the past three years, at Crater Lake and Lassen. This year we made three trips to CRLA, two to do composite burn index (CBI) and vegetation plots in the 2006 Bybee Fire, and one trip to monitor the Cornerstone Prescribed Burn, and do immediate post-burn reads. The Klamath-Cascades Network crew, based at Redwood, also worked in the Bybee fire area, but the table below only shows our plots. For a complete list of CRLA plots, see the Klamath-Cascades Network's report. We were not able to enter data into a FEAT database stored on a computer at another park, so the Redwood crew entered all of our data. The Bay Area Fire Ecologist accompanied the Fire Effects crew on our first trip to CRLA, and on our second trip we had some assistance from an SCA volunteer from Lava Beds. We were also joined on the two trips by an engine crew member from GOGA, who wanted to do a detail with the fire effects crew.

In addition to the plots, we established 24 photopoints (using GPS) on the perimeter of the Cornerstone burn unit. At these photopoints, we took before, during, and after pictures of the prescribed burn, and even some video.

After our CRLA trips, we labeled the several hundred burn, vegetation plot, and CBI photos, wrote the burn report, and organized and sent off the data sheets. A very rough guess would be that we spent another pay period (for three people) carrying out these activities. So in total, we spent approximately four pay periods doing CRLA work.

Park: Crater Lake

Monitoring Type Name	Number of Plots Read in 2007*		
	Pre-burn	Immediate Post	Postburn, (1-20 yrs)
CBI			90
Mountain Hemlock			10
Lodgepole Pine (various mon. types)		3	0
Total Plots for 2007	**0**	**3**	**100**

*This is the total that the PORE crew did

Golden Gate National Recreation Area

Ten-year re-reads were done for three redwood plots at Golden Gate. The Fire Ecologist and GOGA Fire Management staff assisted the Fire Effects crew in reading these plots. No other plots were installed or due to be read.

Park: Golden Gate

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
Northern Coastal Scrub (ARCA)				1	0
Northern Coastal Scrub (BAPI)				11	7
Manzanita Chaparral				4	0
Annual Non-native Grassland (BRDI)				25	3
Annual Non-native Grassland (BRDI2)				5	3
Italian Thistle				5	0
Eucalyptus Forest				1	0
Mustard				1	0
Northern Coastal Prairie				16	9
Perennial Non-native Grassland (PHAQ)				6	2
Perennial Non-native Grassland (FEAR)				4	0
Redwood Forest			3	9	0
Bay Woodland				4	0
Total Plots for 2007	**0**	**0**	**3**		
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 2007	**0**	**0**	**0**		
Total Number of Plots Installed to Date				**12**	

Pinnacles National Monument
A site visit was made to Pinnacles by PORE and GOGA fire management staff, in January 2007. The park hopes to use fire, among other management tools, on their newly acquired lands, and wanted our advice on planning burns. The Fire Effects Crew visited the park in April. The Entrance Meadow yellow star thistle unit was slated to be burned in May, 2007, so six FMH plots (three burn and three control) were installed. Another set of three plots in Pinnacles received their YR10 read; these were in chamise chaparral, on the opposite side of the park.

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			3	26
Mixed Chaparral				28
Blue Oak Woodland				16
Yellow Starthistle	6			6
Total Plots for 2007	**6**	**0**	**3**	
Total Number of Plots Installed to Date				**76**

Point Reyes National Seashore

At Point Reyes, 44 plots YR02 prescribed fire plots were read and 5 YR02 mechanical treatment plots were read. Additionally, 13 new plots were installed in two new monitoring types: native *Deschampsia* grassland, and bishop pine regeneration (from the 1995 Vision Fire). The crew also established photopoints in a new eucalyptus removal area (at Palomarin).

Park: Point Reyes

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
Non-native Annual Grassland			9	22	14
Non-native Perennial Grassland			7	4	3
Non-native Grassland with Scotch Broom				18	0
Non-native Grassland with French Broom			13	13	0
Perennial Grassland: *Deschampsia*	7			4	3
Northern Coastal Scrub				6	4
Bishop Pine (forest plots)				3	0
Bishop Pine (brush plots)	6			3	3
Douglas Fir				1	0
Eucalyptus*			5	5	0
Total Plots for 2007	**13**	**0**	**34**		
Total Number of Plots Installed to Date				**79**	**27**

* These eucalyptus plots were modified FMH plots for assessing stand density before and after mechanical treatment. For details on sampling design please see the Point Reyes Fire Effects Monitoring Plan, Appendix F to the Point Reyes Fire Management Plan.

Santa Monica Mountains National Recreation Area
At SAMO, three-quarters (47) of the plots read burned in the 2005 Topanga wildfire. The other 11 plots read were prescription-burned in 2005 and will be used for monitoring 2008 mowing of a strategic fuel break in Cheeseboro Canyon. Since the data are being used for the Topanga Fire BAR (burned area rehabilitation) monitoring, the SAMO BAR crew assisted the fire effects crew with the plot sampling. The SAMO BAR crew read the 11 AVFA plots, the 12 FORB plots, and 4 of the BRDI plots. One BAR crew member also assisted the fire effects crew on two additional days. Thus, the crew was able to read twice the number of plots as would have been possible on their own.

Park: Santa Monica Mountains

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
Avena fatua Non-native Annual Grassland			11	10	1
Bromus diandrus Non-native Annual Grassland			10	10	0
Non-native Annual Grassland (ANGR)			10	16	8
Phalaris aquatica Non-native Perennial Grassland				10	0
Distichlis spicata Native Perennial Grassland			1	1	0
Nassella pulchra Native Perennial Grassland				8	0
Mustard			1	0	1
Forb (non-native annuals and herbaceous perennials)			12	12	0
Sagebrush Coastal Sage Scrub			6	16	0

Laurel Sumac Coastal Sage Scrub				1	0
Chamise Chaparral			5	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
Total Plots for 2007	**0**	**0**	**58***		
Total Number of Plots Installed to Date				132	11

* Twenty-seven of these plots were read by the BAR crew, instead of the fire effects crew

Management Objectives and Monitoring Results 2007

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^o)/decrease exotic species cover (2^o)	10 year change ARCA cover* Control +195% (11%- +440%) Burn -17.5% (44%- -85%)	No (1^o) TBD (2^o)
Nassella pulchra grassland (Santa Rosa Island)	Increase native grass cover (1^o)/decrease exotic species cover (2^o)	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^o) TBD (2^o)
SCI Fennel	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. Reduce total above ground biomass, in fennel dominated areas, by 60-90% immediately following treatment Limit fire spread in shrub dominated areas with less then 40% relative cover of fennel. Less than 20% increase in cover of exotic species during the first three years following treatment Less than 20% decrease in cover of native grass and herbaceous species during the first three years	Fennel Burn Cancelled	No data

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

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

	variation, such as the record low rainfall in the 2006 water year, affect 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 α= 0.05
# Indicates that results are not statistically significant at α= 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

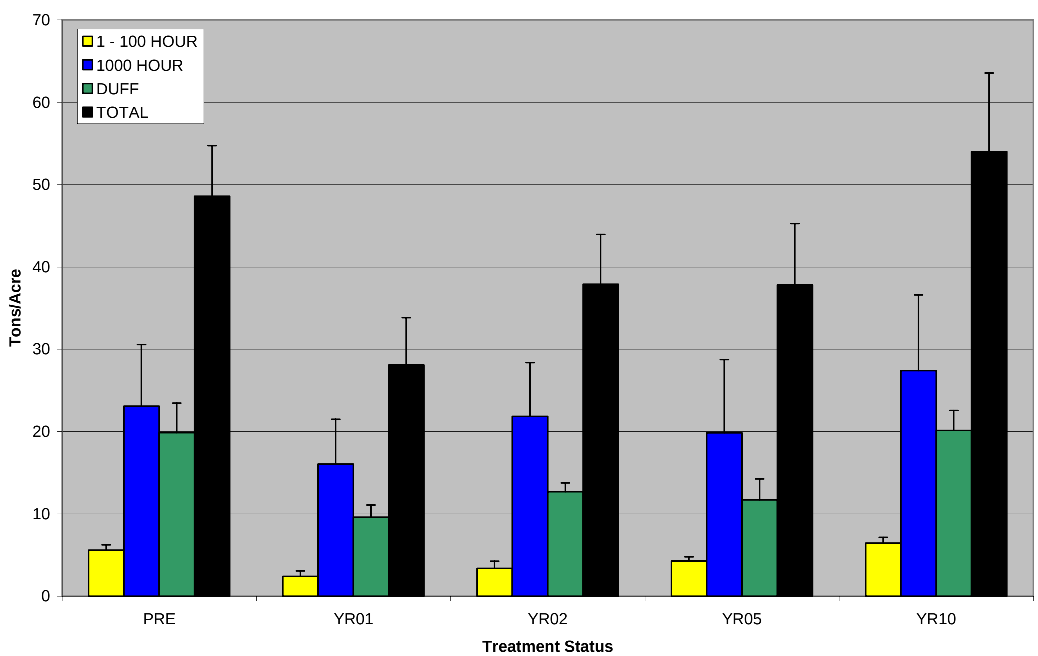
Monitoring Unit	Management Objective	Monitoring Results (90% CI)	Objective Achieved?
Redwood Forest	Reduce fuel loading (1º)/Restore natural fire regimes(2º)	1º: No significant difference in fuel loading between PRE and YR10* 2º:N/A – objective too vague (n=8)	1º: No 2º: N/A

* 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.

Discussion
Three prescribed burns were conducted in Muir Woods in the mid-to-late-1990's. 18 acres were burned in 1996, 36 acres were burned in 1997, and 32 acres were burned in 1998. All three burns were conducted in fall with the objectives of reducing fuel loading and restoring natural fire regimes. Data analysis here will focus on fuel loading and post-fire regeneration of coastal redwood and Douglas-fir.

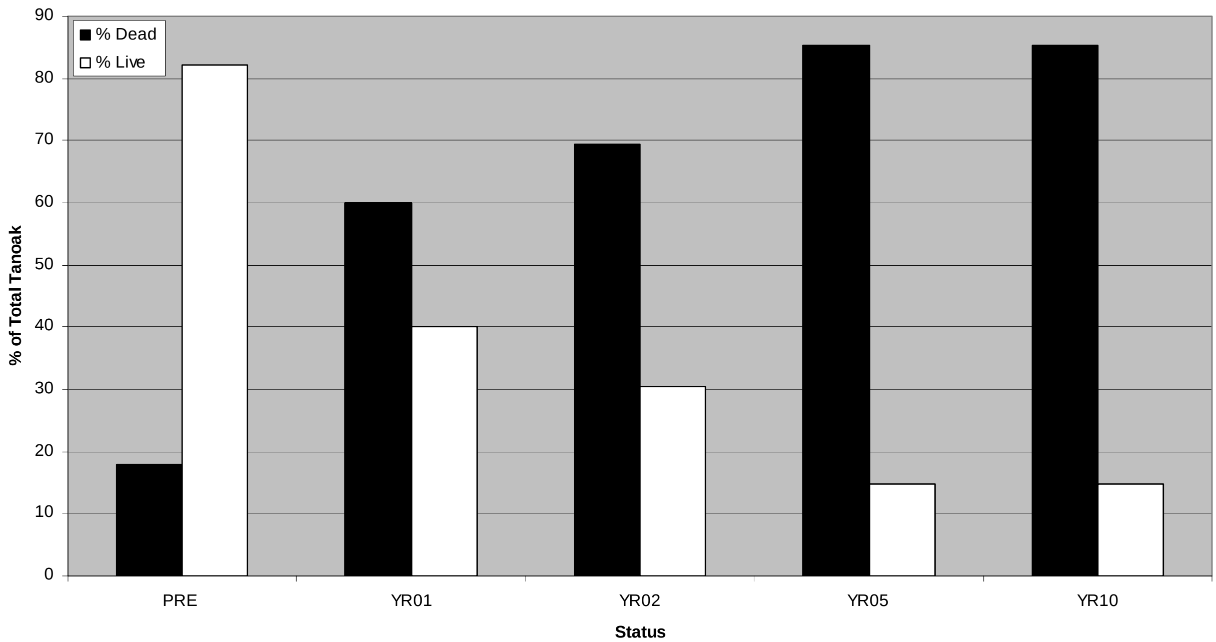
Fuel Loading
The prescribed burns were successful in reducing fuel loading in the short term. Total fuel loading was significantly decreased one year post-fire as compared to before the fire treatment. However, by two years post-fire, fuel loadings had returned to close to pre-burn levels. See Figure 1.

Figure 1. Fuel loading at Muir Woods National Monument



This increase in post-fire fuel loading was largely caused by dying tanoaks, both in response to the fire and in response to Sudden Oak Death which has been present at Muir Woods since the mid-1990's. Figure 2, shows the proportion of live versus dead tanoaks on fire effects monitoring plots across the monitoring period.

Figure 2. Proportion of Dead versus Live Tanoaks



Regeneration

These prescribed fires were also effective in spurring regeneration of both redwoods and tanoaks. Figure 3 shows redwood regeneration (not including resprouts) before and after burning broken out by year burned (1996 versus 1997). Regeneration response was highly variable both between plots and between the two burns. The 1996 burn resulted in much higher rates of redwood regeneration than the 1997 burn. One possible explanation for this is the difference in fire behavior between the two burns. There was better consumption of litter fuels in the 1996 burn which may have favored regeneration as redwoods require bare mineral soil for germination.

Douglas-fir also showed a response in regeneration to the prescribed fires. Figure 4 shows Douglas-fir seedlings before and after fire also broken out by burn year. In the case of Douglas-fir, there was almost no regeneration in the first year after fire for the 1996 burn while there was fairly strong regeneration after the 1997 burn. One possible explanation for this difference is that Douglas-fir is a masting species. The calendar year 1998 may have simply been a good seed year for Douglas-fir. There were also precipitation differences between 1997 and 1998 which may have been a factor in the differences in Douglas-fir regeneration between the two burns.

Overall, the regenerative response of both redwood and Douglas-fir following fire were encouraging and speak to the potential for using prescribed fire to spur regeneration in this monitoring type.

Figure 3. Redwood Regeneration

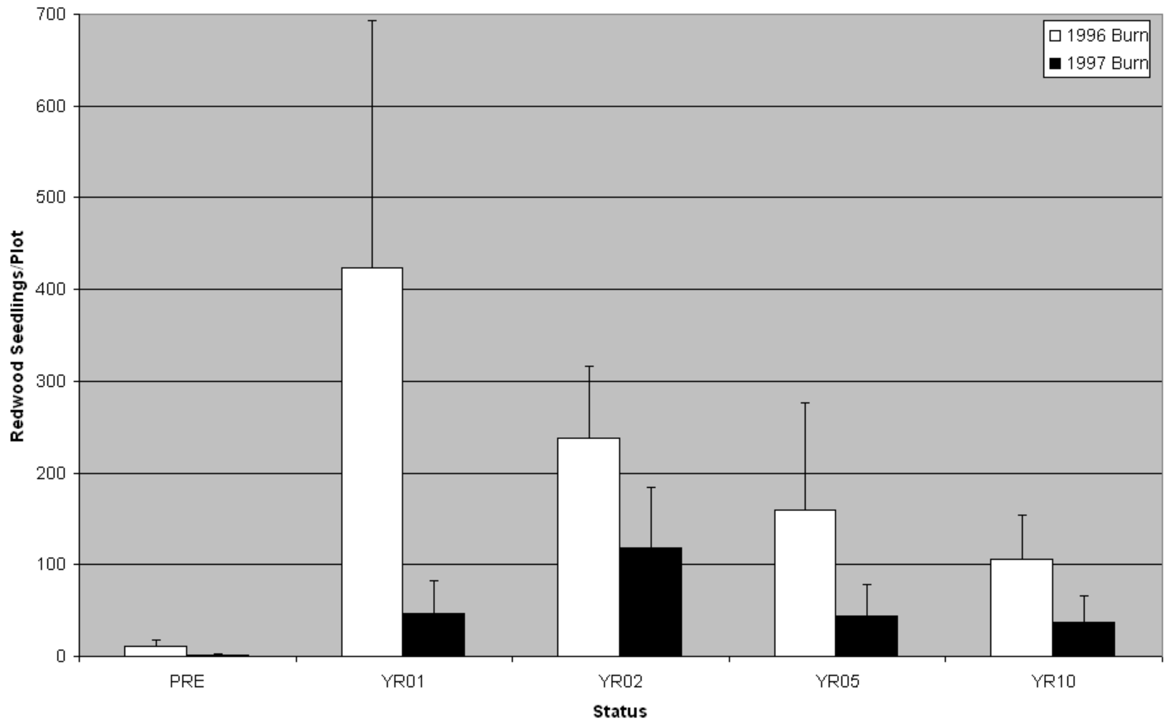
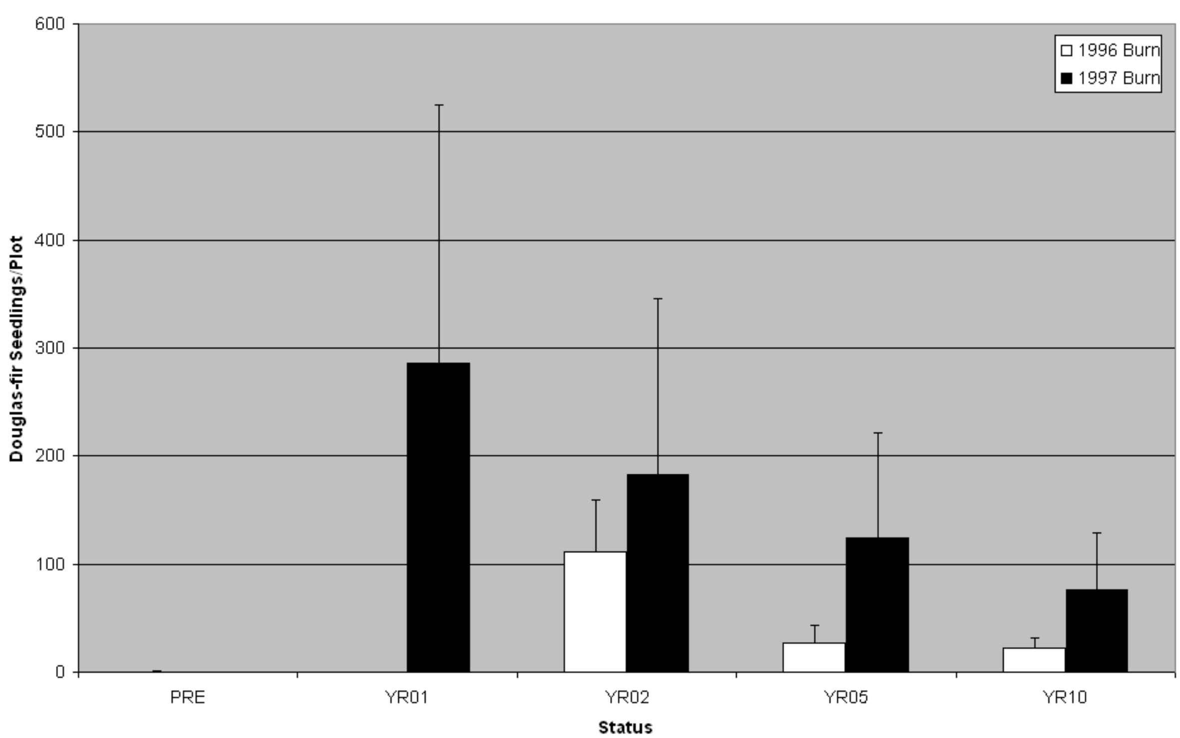


Figure 4. Douglas-fir Regeneration



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 α= 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.

Discussion
A series of prescribed burns were carried out at Pinnacles NM during the 1990's. Fire effects monitoring plots were installed in chamise chaparral, California mixed chaparral and blue oak woodland monitoring types. All of the chamise chaparral plots reached their 10 year read by 2007. Data analysis here will focus on the burn response of chamise (*Adenostoma fasciculatum,* ADFA) as well as native versus non-native grass and forb cover.

Figure 5 shows percent cover ADFA over time. ADFA cover was significantly reduced in the first several years after fire, but has recovered to close to its original cover over the ten year monitoring period.

Figure 5. *Adenostoma fasciculatum* (ADFA) cover over time

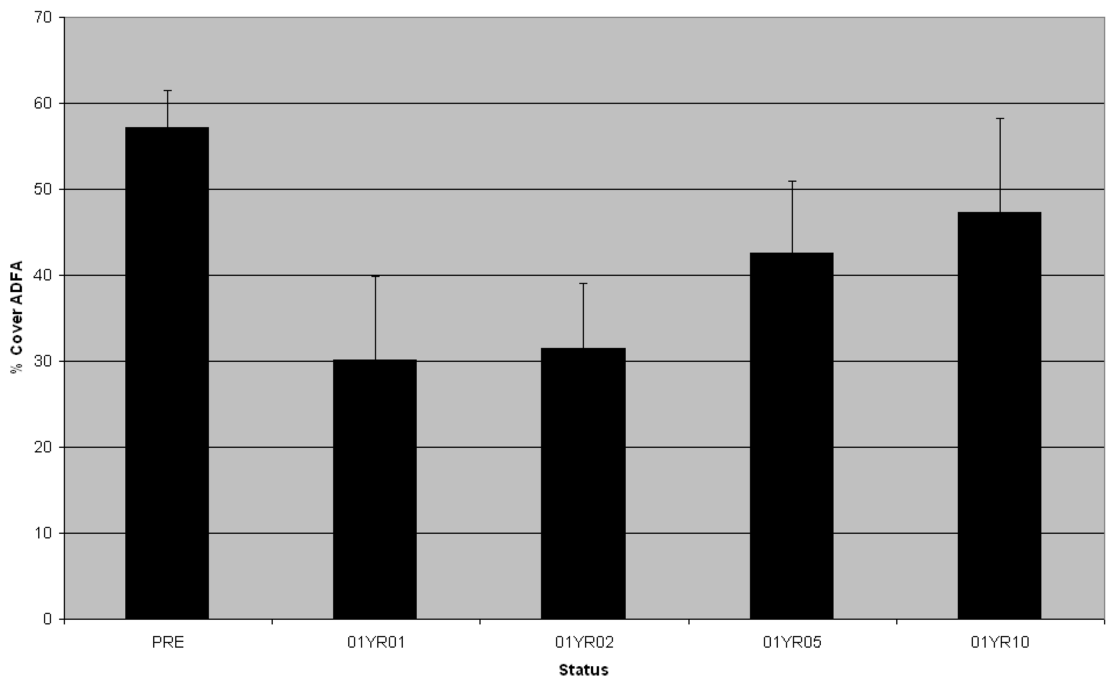


Figure 6 shows change in percent cover of native and non-native forbs pre-fire and over time post-fire. In the first two years after fire, there was a significant increase in both native and non-native forb cover, although native forbs dominated. Ten years post-fire, non-native forbs cover is still slightly elevated as compared to pre-burn levels.

Figure 6. Native and Non-native Forb Cover

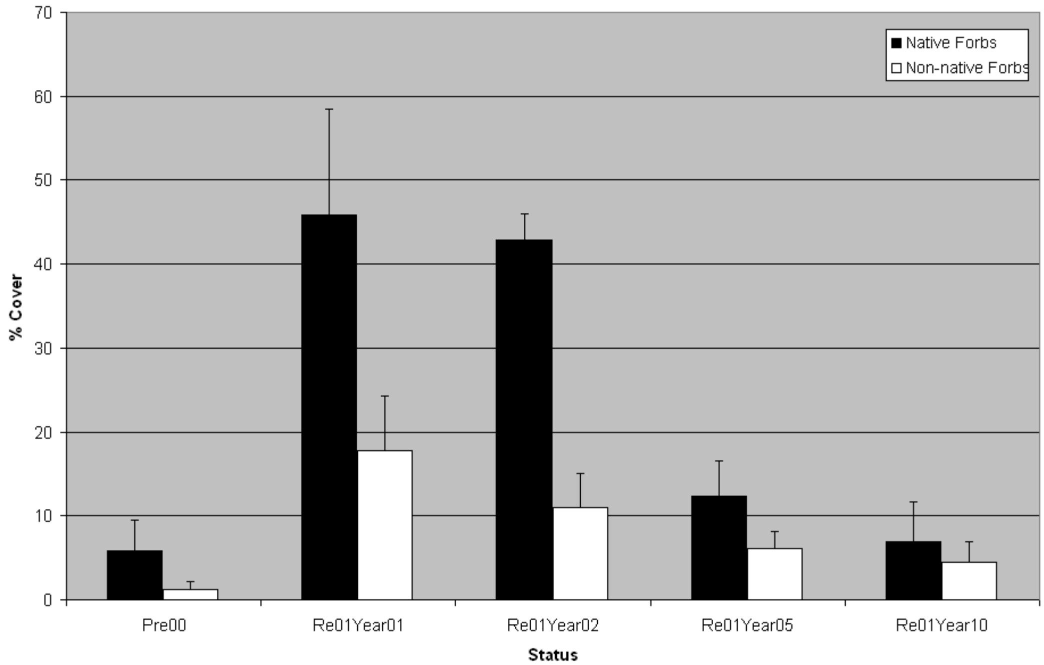


Figure 7. Native and Non-native Grass Cover

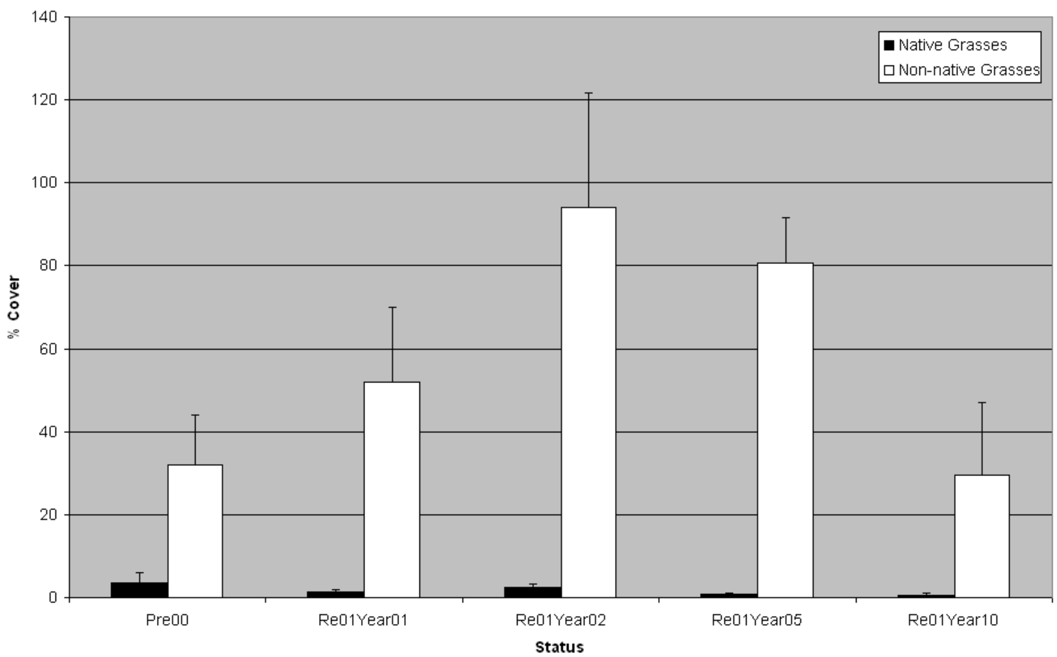


Figure 7 shows change in percent cover native and non-native grasses pre-fire and over time post-fire. In the first two years after fire, non-native grasses increased from 32 to 94% cover. Since then, non-native grass cover has returned to pre-fire levels. Ten years after burning, in 2007, non-native grasses returned to 30% cover. Native grasses decreased from 3% cover to less than 1% cover over the study period, but the change was not statistically significant.

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 (1º)/Increase cover of native species (2º)	1º: No significant difference between seeded and unseeded plots in absolute % cover BRCA 2º: Burn plots had an 11% increase in natives versus a 2% increase for control plots (n=6 burn plots; n=3 control plots)	1º: No 2º: Yes
Non-native Perennial Grassland	Decrease cover of BAPI(1º)/Maintain or decrease cover of PHAQ(2º)/Maintain or Increase cover of native spp. (3º)	1º: 10±3% decrease in absolute cover BAPI for burn plots versus 5± 2% increase in absolute cover BAPI for control plots 2º: No difference in absolute % cover PHAQ between treatment and control 3º: 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)	1º: Yes 2º: Yes 3º: No
Eucalyptus	To decrease the standing BA of eucalyptus(1º)/To decrease dead and downed fuel loading at the site(2º)/To minimize eucalyptus resprouting(3º)/To maintain GEMO2 density at or below pre-treatment levels(4º)	1º: 811-4315 cm^2 reduction in basal area of eucalyptus 2º: No statistically significant change in fuel loading 3º: 0-22% rate of resprouting 4º: -.2 - 22 stems/m^2 reduction in GEMO2 density[#] (n=4)	1º: Yes 2º: No 3º: Yes 4º: Unknown: sample size is too small.
French Broom	French broom reduction(1º)/native plant enhancement(2º)	1º: 35-103% Reduction in absolute cover of French broom 2º: 0-11% Reduction in native species[#] (n=11)	1º: Yes 2º: No

[#] Indicates that results are not statistically significant at α= 0.1

Discussion

The prescribed burning program at Point Reyes National Seashore has been focused on a combination of fuel reduction and weed control. Weed control treatments have been directed primarily at French and Scotch broom (*Genista monspessulana* and *Cytisus scoparius* respectively). Perennial non-native grasses such as Harding grass (*Phalaris aquatica*) and velvet grass (*Holcus lanatus*) are also a concern. These species are spreading within the Seashore and there is concern that they may be favored over native grasses by prescribed burning. Data analysis here will focus on results from 15 years of broom treatment within the Seashore as well as on recent fuel reduction burns and their impacts on Harding grass.

Broom

French and Scotch broom are both non-native invasive shrubs that are classified as Noxious Weed List C by the State of California and as high impact by the California Invasive Plant Council (CalIPC). They are nitrogen fixers in the Fabaceae family. They are also prolific seeders; according to one estimate a medium sized bush can produce as many as 8,000 seeds in a given year. These seeds build up in a buried seedbank which is extremely dense (on the order of several thousand seeds/m^2) and is stimulated by disturbance. Both species begin producing seed at 2-3 years and are able to resprout from cut stems. Fire is known to be effective in treating broom infestations. The initial treatment stimulates the seed bank and results in a flush of new seedlings. At least two follow-up burns are required to kill the seedlings before they set seed and to finish flushing the seed bank.

PRNS has been using prescribed fire to control French broom since 1996 and Scotch broom since 1993. Since that time the three broom treatment areas, Strain Hill, McCurdy, and Drakes Estero, have been burned as many as 5 times in places. A total of close to 1,700 acres of prescribed fire treatment for broom control have been carried out which is close to 60% of all of the prescribed burning that has been done at PRNS over the same time period. The objectives of these burns have been to 1. reduce fuel loading, 2. maintain or increase cover of native species, and 3. maintain or decrease cover of Scotch/French broom. A total of 29 fire effects monitoring plots have been installed in the French and Scotch prescribed burn units.

The most recent broom burns in the Seashore took place in 2005 and were targeted at reducing French broom in the Strain Hill and McCurdy burn units. This was the fourth burn in these units. Figure 8 shows the response of French broom to this most recent fire treatment. Broom cover dropped from 42% pre-fire to 10% one and two years after fire. Figure 9 shows the percent cover broom across the entire monitoring period from 1996 to 2007. Four burns were carried out over this time period at an interval of two to five years between burns. From this figure it is clear that repeated burns are effective in reducing broom cover to below the 10% level. However, without follow-up treatment in the form of hand pulling or another more fine scale approach, broom cover will slowly increase over time without treatment. Fire alone is not sufficient to eradicate broom from a site.

There are ecological costs to using fire to reduce broom cover. Typically, broom is replaced with non-native grasses. Figure 10 shows the percent cover of non-native grasses over the study period. Non-native grass cover increases from 35% pre-treatment to 60% after two treatments and remains around 60% cover for the remainder of the study period. Figure 11 shows the change in cover of all native species over the study period. Prior to treatment, mean native cover on these plots was 29% and after treatment native cover was 16%. This is a statistically significant decrease ($p=0.016$).

Figure 8. French Broom Cover Following the 2005 Prescribed Fires

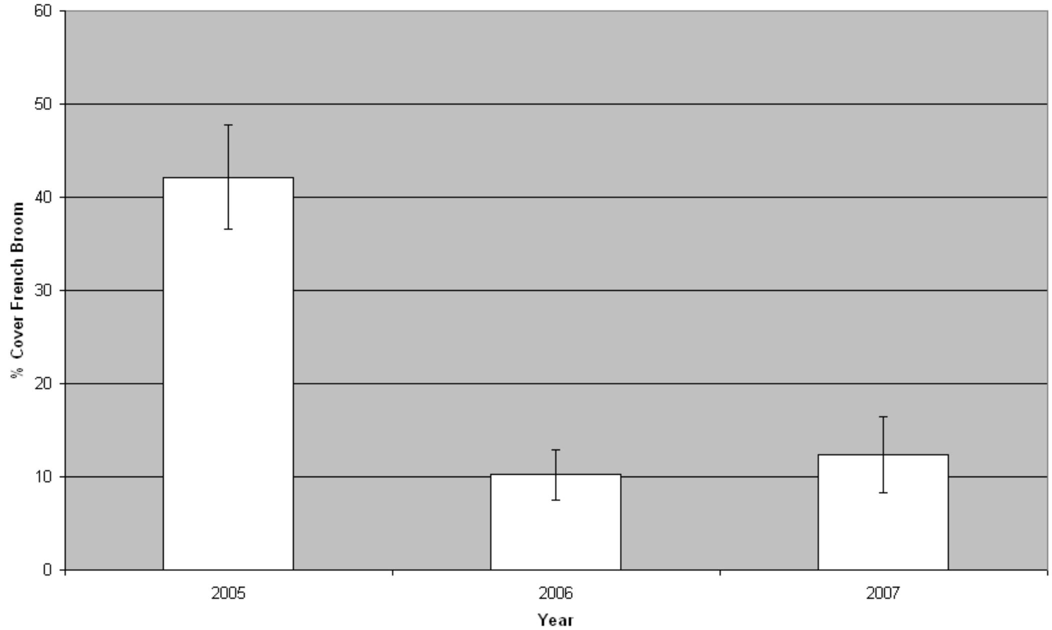


Figure 9. French Broom Cover 1996-2007. Red bars indicate prescribed burns.

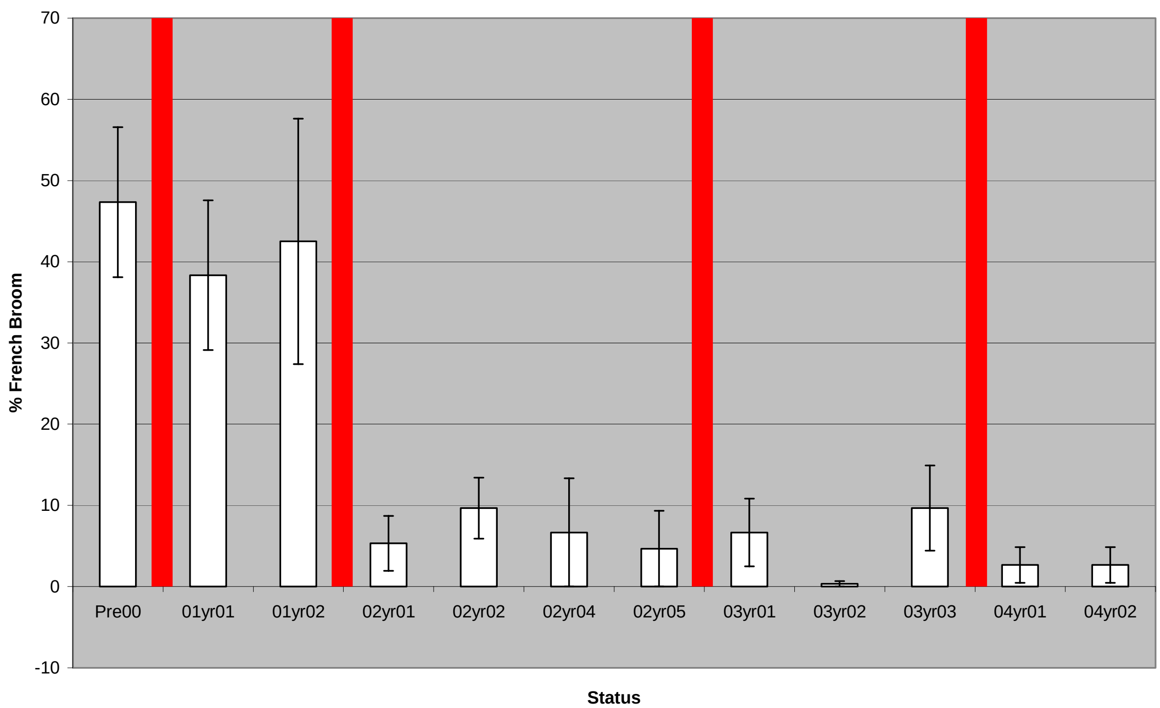


Figure 10. Non-Native Grass Cover 1996-2007. Red bars indicate prescribed burns.

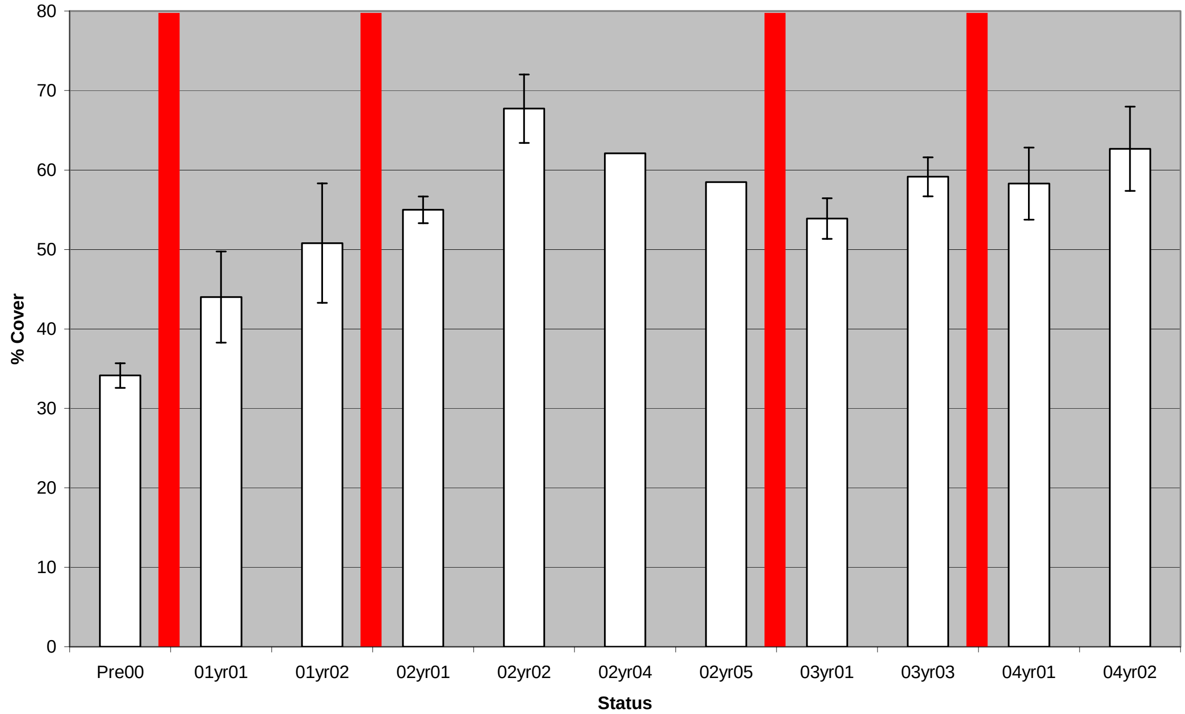


Figure 11. Native Cover 1996-2007. Red bars indicate prescribed burns.

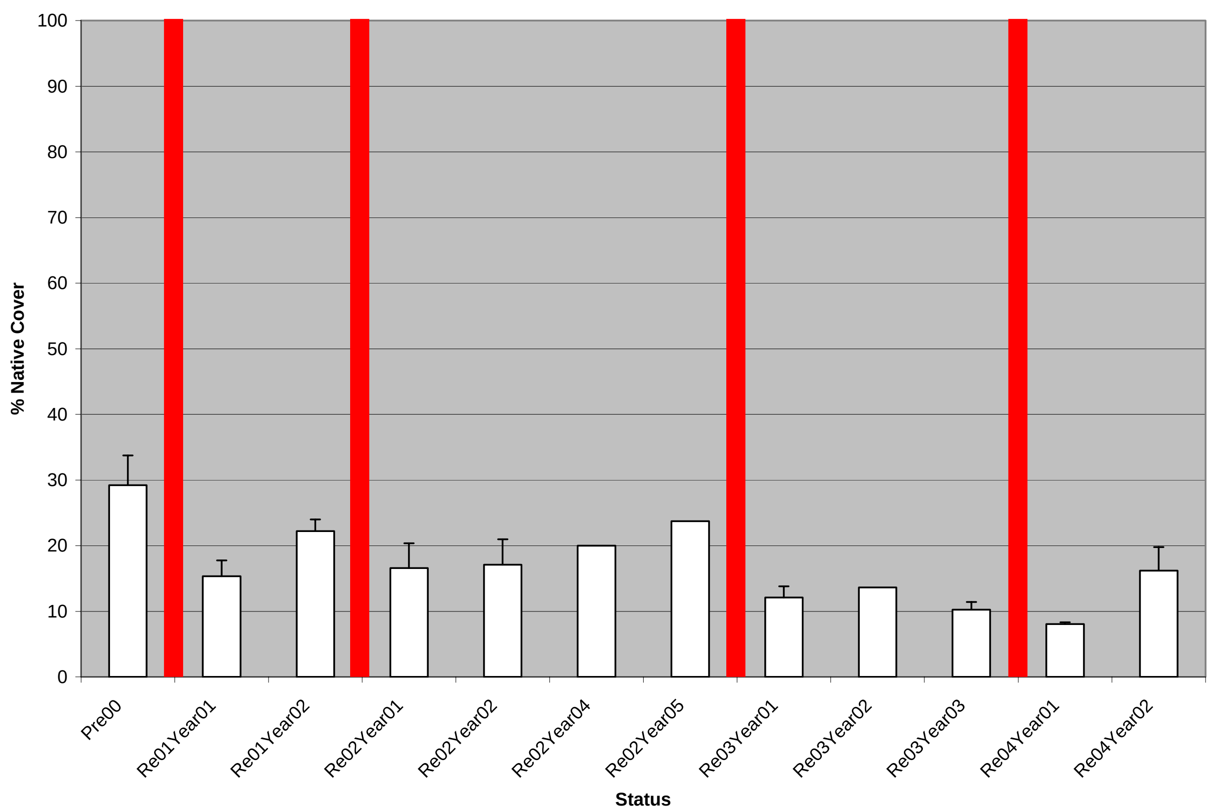
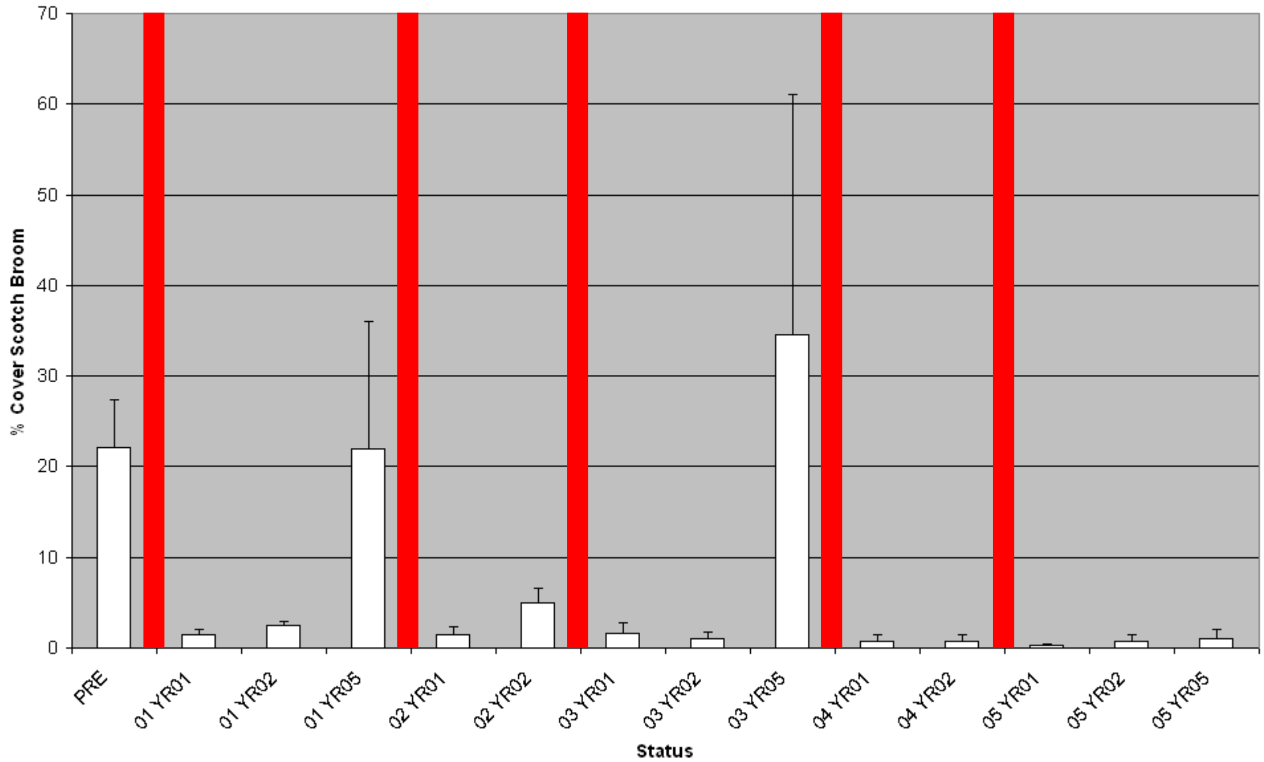


Figure 12 shows the response of Scotch broom to repeated prescribed fire treatment over the period from 1993-2001. Overall patterns of Scotch broom response to fire are similar to the response of French broom. Most plots were burned every other year and overall broom cover was reduced from over 20% to less than 5%. However, two plots were not burned for 5 years after the first and third treatments and those plots had large increases in broom cover in year 5 following treatment. Again, this is evidence that repeated burning is only effective if a 2-3 year fire return interval is maintained and if fine scale treatment is implemented after fire treatments are completed.

Figure 12. Scotch Broom Response to Fire 1993-2001



Harding Grass
In 2005 and 2006, PRNS implemented the first two burns in a series planned for a fuel break along Limantour Road. A total of approximately 70 acres have been treated thus far. Vegetation is dominated by coyote brush and non-native grasses with a minor component of post-Vision Fire bishop pine regeneration. The objectives of these burns were to decrease the cover of coyote brush, maintain or increase the cover of native plants, and maintain or decrease the cover of Harding grass. Prior to implementing these burns, park managers were concerned that the disturbance caused by fire would allow Harding grass to spread north along Limantour Road from the areas along the beach where it is currently concentrated. Harding grass is a perennial non-native invasive that is classified as having moderate impact by CalIPC.

Figure 13 shows the cover of Harding grass before and after prescribed fire treatment. Harding grass cover is greater than 90% on our plots, but was not significantly increased by fire treatment. Figure 14 shows the response of non-native species to prescribed fire treatment in this area. Similarly to in other parts of the park, non-natives are favored by fire. Burned plots had a 5% increase in non-native cover as compared to a 1% decrease in control plots. This difference is statistically significant (p=0.048).

Figure 13. Harding Grass Response to Fire

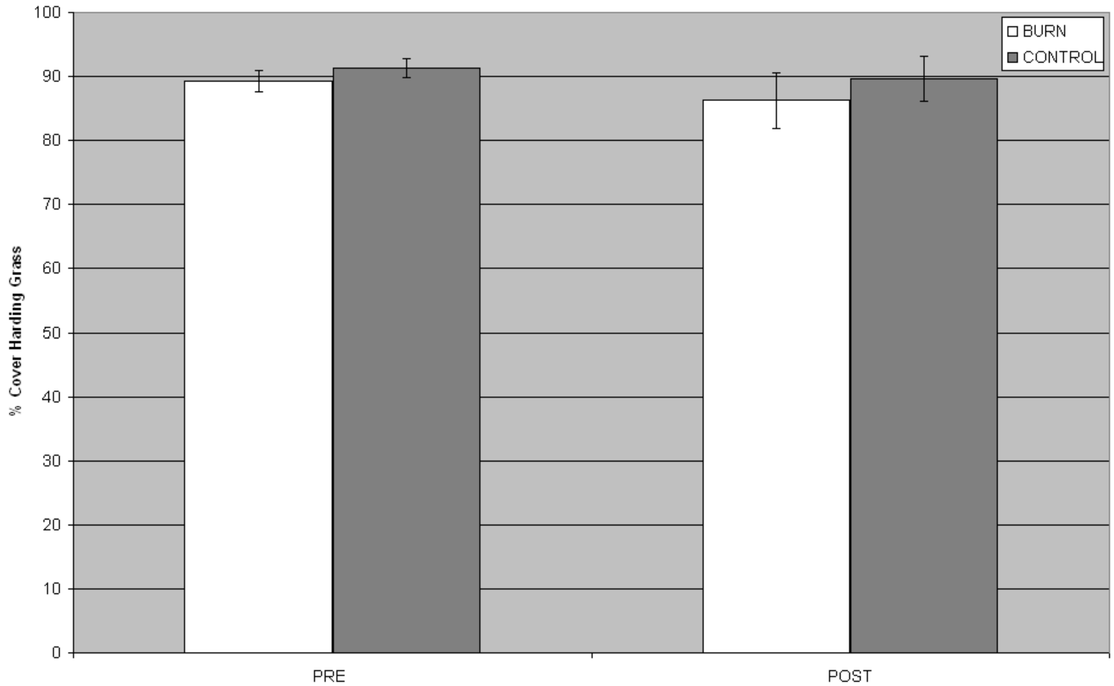
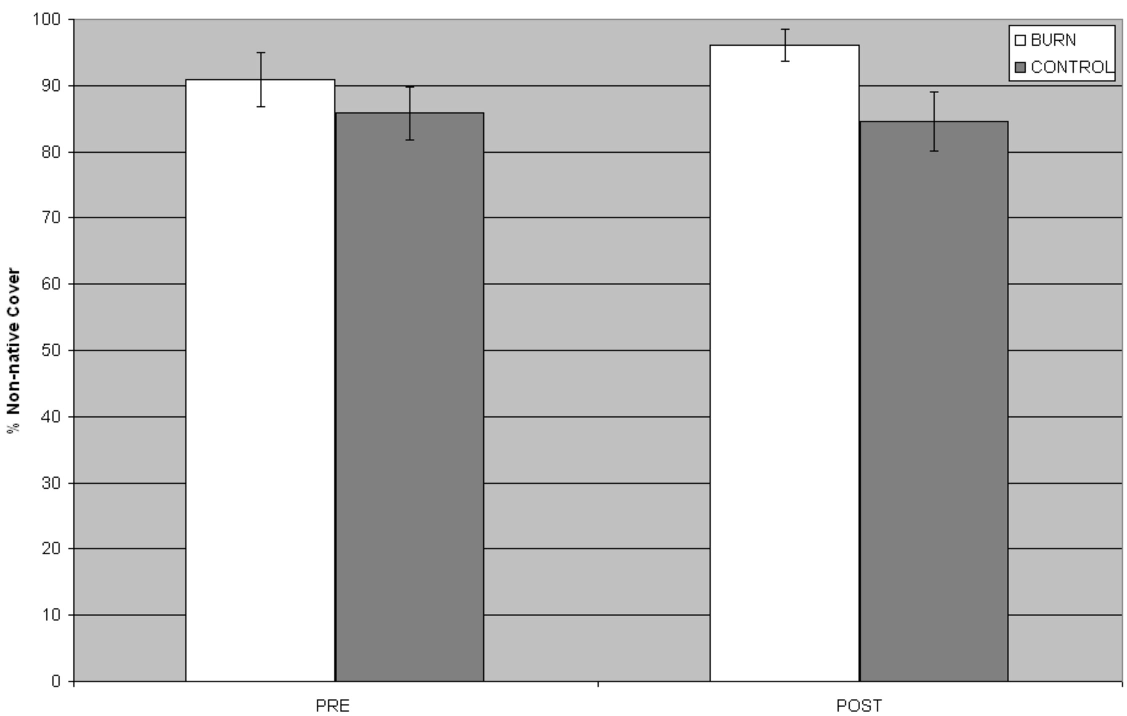


Figure 14. Non-Native Species Response to Fire



Park: Santa Monica Mountains NRA

Monitoring Unit	Management Objective	Monitoring Results (95% CI)	Objective Achieved?	N Burn	N Control
Avena fatua Non-native Annual Grassland	Quantify the effects of different fire return intervals and environmental variability on annual grassland composition[1]	Ongoing	TBD	10	1
Bromus diandrus Non-native Annual Grassland	Quantify the effects of different fire return intervals and environmental variability on annual grassland composition[1]	Ongoing	TBD	10	0
Non-native Annual Grassland (ANGR)	Reduce biomass annually without increasing non-native forb cover	PRE for 2008 mow treatment	NA	6	4
Phalaris aquatica Non-native Perennial Grassland	Eliminate PHAQ (mow and spray)	Completed 2007	YES	10 mowed	0
Distichlis spicata Native Perennial Grassland	Maintain or increase DISP cover	PRE for 2008 mow treatment	NA	1	0
Nassella pulchra 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 TBD	8	0
Mustard	Quantify the effects of different fire return intervals and environmental variability on annual grassland composition[1]	Ongoing	TBD	0	1

FORB (non-native annuals and herbaceous perennials)	Quantify the effects of fire and restoration treatments on annual grassland composition**	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 Chaparral	Legacy data[3]		NA	5	0
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.	Pending	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 2007

Monitor	Starting Date	Ending Date	# of Pay Periods	Training and Development
Alison Forrestel	n/a	n/a	26	Point Reyes Leadership Academy
Marti Witter	n/a	n/a	26	
Wende Rehlaender	1-14-07 3-25-07	2-24-07 12-29-07	23	Point Reyes Leadership Academy, L-280
Christina Barba	4-1-07	10-13-07	14	Grass class, S-290
Lance Glasgow	4-1-07	10-13-07	14	Grass class

Accomplishments and Focus Areas for Fire Ecologists and Fire Effects Monitors

Bay Area Fire Ecologist

Category	% Time	Accomplishments/Focus Area
General Planning	25%	• Assisted with planning and project review for PORE fuels projects • Assisted with PORE/GOGA/PINN operational FMP's • Worked with PINN on planning for proposed new

		lands burn • Completed PORE Resource Advisor Guide and Kit
Monitoring Plans	15%	Completed PORE Monitoring Plan
Presentations	15%	• Organized and presented data at the 2nd Annual Fire Effects Forum for PORE & GOGA • Presented at the San Domenico Women in Sciences conference • Presented at SOD workshop • Presented at State Parks Conference • Presented at regional Fire Ecology meeting • Presented FEAT training at regional Fire Ecology meeting • Presented FEAT training via internet twice • Co-hosted and presented at Sonoma State fire ecology field trip • Co-hosted and presented at Marin manzanita workshop • Co-hosted GPS training for fuels crews
NPS Meetings / Task Groups	10%	• Organized second annual Fire Effects Forum • Facilitated monthly meetings/fieldtrips for PORE fire & resource management staff
Interagency Work		
Fire Assignments and Fuels Projects	2%	GISS on Tin Cup Fire, MT
Research	5%	• Completed field work and collaborated on final report for CESU project with Max Moritz at UC Berkeley to examine SOD and fire at PORE. • Secured grant funding for work on SOD treatment with AgriFos and for SOD outreach
Monitoring Field Work	6%	Assisted with field work at GOGA and CRLA.
Data Entry	0%	Monitors completed data entry.
Data Management and Conversion	0%	FEAT conversion was completed in FY05.

Data Analysis	5%	• Completed data analysis for planning, presentations, and annual report.
Supervision/Admin	15%	• Supervised lead monitor • Travel & time paperwork • Administered CESU agreement with UC Berkeley
Training & Professional Development	7%	• Fire refresher • Point Reyes Leadership Academy

<u>Mediterranean Coast Fire Ecologist</u>

Category	Accomplishments/Focus Area
General Planning	• Initiated comprehensive database of all private properties along NPS property boundaries as part of updating the park's defensible space fuel management program. • Worked with the park FMO, prescribed fire specialist, and fire GIS specialist to develop priorities for strategic fuels proposals • Participated in fire program review by regional fire staff.
Monitoring Plans	• Scheduled for 2008 workplan.
Presentations	• *Vegetation and Fire Management in the Santa Monica Mountains.* California State Park Ecologists Annual Meeting. January 24, 2007. • *Fire ecology and fire management in the Santa Monica Mountains*. Guest lecture Biology 533/592C, Conservation Biology, CSUN. November 1, 2007. • *Santa Monica Mountains Wildfire Management Plan Design and Considerations.* Guest lecture in Chaparral Fire Ecology and Wildfire Management Issues in Southern California Seminar Series at the Cheadle Center for Biological Diversity, UCSB. November 5, 2007.
NPS Meetings / Task Groups	• SAMO fire management meetings for fuels project planning • Annual FMP presentation to park staff with FMP and Fire GIS specialist • BAER organization and progress meetings • Environmental Review Team as project representative and as occasional PSRM representative.
Fire Assignments and Fuels Projects	• READ to FMO on Corral fire

Research/ Co-operative Projects/Park Projects	• Julie Clark DeBlasio completed her MA thesis at UCLA in Urban Planning on *Defensible Space: Environmental Implications of Fire Clearance Regulations in the Santa Monica Mountains National Recreation Area* • Chris Bowman (CSUN, MS student Biology) began work on postfire demography and ecology of the federally endangered plant species *Astragalus brauntonii*. • Provided Stephen Davis (Pepperdine University) with $25,000 through NPS fire research funds to investigate the impact of drought on post fire recovery in resprouting chaparral species. Project title: *Mechanisms and Effects of Resprout Failure on Post-fire Chaparral Regeneration* • Proposal 2007 WNPA *Conservation Genetics, Global Warming and the Fate of Valley Oaks in the Santa Monica Mountains National Recreation Area*. Submitted with Dr Mary Ashley, University of Illinois, Chicago. • Genetic variability of the southern population of *Quercus lobata* (with Mary Ashley) • Monitoring postfire effects in *Quercus lobata* sapling oaks (SAMO). • Coordinating with USGS debris flow monitoring and early warning project in Canyon and Corral fire areas. • Provided consultation to Denise Knapp in establishing herbivory exclosures to examine the impacts of non-native browsers on the recovery of endemic island chaparral on Catalina Island after the Empire Fire.
Technical Assistance	• Participated on the Griffith Park Fire Recovery Task Force • Helped develop UC Cooperative Extension and LA County Fire SAFE Fire Landscape Calendar (9800 copies sent to SMMNRA residents by FIO)
Monitoring Field Work	• The PORE fire effects crew completed final 10-year read of Santa Rosa Island Ranch Burn plots in coastal sage and *Nassella*. Julie Christian (MS Environmental Science, U Wisconsin) will use the FEAT data from SRI as part of her master thesis on shrub dynamics at CHIS. • The PORE fire effects crew set up new plots on Santa Cruz Island to monitor CSS recovery and fennel postfire recruitment in a small summer wildfire on Nature Conservancy property. • The PORE fire effects crew did YR2 measurements of the shrub and grassland plots that burned in the Topanga Fire. • The PORE fire effects crew re-measured annual grass 2005 prescribed fire plots that will be used as pre-treatment measurements for a planned 2008 mow treatment.
Data Entry	Fire effects monitors complete data entry.
Data Management and Conversion	• Data for FFI conversion submitted by PORE Fire Ecologist • All FMH/FEAT plot photos and data sheets have been scanned and are in digital format.

Data Analysis	Data analysis for projects, publications, presentations, and annual reports.
Supervision/Admin	• Administered Topanga BAR project • Coordinator Corral BAER project
Publications	• Witter, M.S., R.S. Taylor, S. Davis. 2007. *Vegetation response to wildfire and fire history in the Santa Monica Mountains, California* in *The Santa Monica Mountains,* Proceedings of the Southern California Botanists Annual Meeting, 2006, Fullerton, CA. Special Publication. • Witter, M., J. Orrock, and O. J. Reichman. 2007. *Grassland restoration impacted by herbivore mediated apparent competition with Brassica nigra*. Wildlife and Invasive Plants: Finding Common Ground to Protect Ecological Diversity a joint symposium between Cal-IPC and The Wildlife Society, January 30-31, 2007. Monterey, CA. Poster • Orrock, John, M. Witter and O. J. Reichman. 2007. Native consumers and seed limitation constrain the restoration of a native perennial grass in exotic habitats. Restoration Ecology. *In press* • Orrock, John, M. Witter and O. J. Reichman. 2007. Native consumers and biological invasion maintained via apparent competition. Ecology. *In press* • Taylor, Robert, M. Witter, J.Tiszler, and R. Sauvajot. 2007. *Progress and challenges of managing fire in the wildland-urban intermix of the Santa Monica Mountains National Recreation Area, Los Angeles, California*. Medecos XI 2007. Perth, Australia September 2-5, 2007. Abstract.

Fire Effects Crew

Category	Percent Time		Accomplishments/Focus Area
	Crew	Lead	
FMH Plots	40%	24%	Includes 12 travel days per person to away parks.
Mechanical Treatment Plots	3%	0%	Eucalyptus plots at PORE
Other Projects	1%	1%	• Miscellaneous • Surveyed for Marin Manzanita in an area to be cut • Established photopoints at eucalyptus removal site • Cleared vegetation away from RAWS
Fire Assignments	17%	11%	• A burn with a local agency (one day) • FEMO assignment on fire-use fire in Montana (14 days, plus 4 travel days) • FEMO's on prescribed burn at CRLA (6 days plus 2 travel days) • Prep for burn (burn postponed) at YOSE (2½ days plus one travel day) (note: numbers of days are per person)
Data Entry, Slide & Photo Labeling, Keying Vouchers, and Miscellaneous Office Work	26%	5%	
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%	4%	
Training and Development	8%	8%	Fire refresher, training and development as noted in previous table, regular PT
Orientation and Informal Training	5%	4%	Learning and teaching
Assisting Other Divisions	0%	3%	• Mapping *Danthonia* on SRI; also *Castilleja* monitoring, CSS plots, and clean-up projects • Bird survey after oil spill

DATA APPENDIX

CHIS SRI ARCA Plots
Change in ARCA cover, Control=0, Burn = 1

Two-Sample T-Test and CI: PreCover, BurnControl

```
Two-sample T for PreCover

BurnControl   N  Mean  StDev  SE Mean
0            12  18.8   15.3      4.4
1             7  35.3   18.4      6.9

Difference = mu (0) - mu (1)
Estimate for difference:  -16.45
95% CI for difference:  (-34.77, 1.86)
T-Test of difference = 0 (vs not =): T-Value = -2.00  P-Value = 0.073  DF = 10
```

Two-Sample T-Test and CI: Yr10Cover, BurnControl

```
Two-sample T for Yr10Cover

BurnControl   N  Mean  StDev  SE Mean
0            12  41.6   22.7      6.5
1             7  27.0   17.9      6.8

Difference = mu (0) - mu (1)
Estimate for difference:  14.58
95% CI for difference:  (-5.50, 34.67)
T-Test of difference = 0 (vs not =): T-Value = 1.55  P-Value = 0.143  DF = 15
```

Descriptive Statistics: %Change

```
Variable  BurnControl   N  N*   Mean  SE Mean  StDev  Minimum     Q1  Median
%Change   0            12   0  195.6     37.9  131.2     11.1   81.7   187.3
          1             7   0  -17.5     15.2   40.2    -84.5  -37.5   -15.2

Variable  BurnControl     Q3  Maximum
%Change   0            295.0    440.0
          1             11.8     43.9
```

Two-Sample T-Test and CI: %Change, BurnControl

```
Two-sample T for %Change

BurnControl   N    Mean  StDev  SE Mean
0            12    1.96   1.31     0.38
1             7  -0.175  0.402     0.15

Difference = mu (0) - mu (1)
Estimate for difference:  2.131
95% CI for difference:  (1.255, 3.006)
T-Test of difference = 0 (vs not =): T-Value = 5.22  P-Value = 0.000  DF = 14
```

One-way ANOVA: %Change versus BurnControl

```
Source       DF     SS     MS      F      P
BurnControl   1  20.07  20.07  17.14  0.001
Error        17  19.91   1.17
Total        18  39.97

S = 1.082   R-Sq = 50.20%   R-Sq(adj) = 47.27%

                          Individual 95% CIs for Mean Based on Pooled StDev
Level   N    Mean  StDev     +---------+---------+---------+---------
0      12   1.956  1.312                           (------*-----)
1       7  -0.175  0.402     (-------*--------)
                             +---------+---------+---------+---------
                          -1.0       0.0       1.0       2.0

Pooled StDev = 1.082
```

Descriptive Statistics: Absolute Change (% Cover)

```
Variable                  BurnControl   N  N*   Mean  SE Mean  StDev  Minimum
Absolute Change (% Cover  0            12   0  22.75     3.44  11.92     3.00
                          1             7   0  -8.29     9.21  24.36   -60.00

Variable                  BurnControl     Q1  Median     Q3  Maximum
Absolute Change (% Cover  0            14.00   24.00  32.25    44.00
```

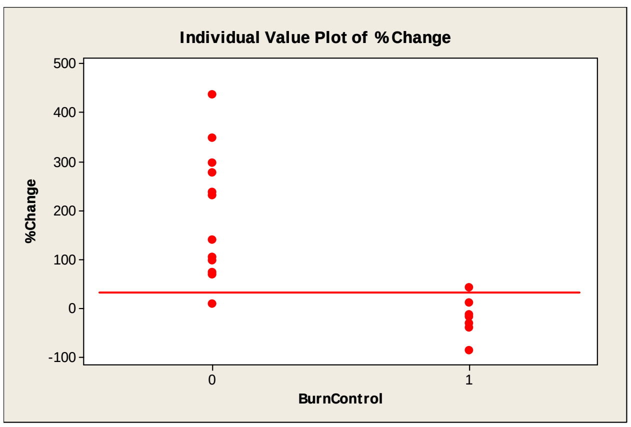
Two-Sample T-Test and CI: Absolute Change (% Cover), BurnControl

```
Two-sample T for Absolute Change (% Cover)

BurnControl   N  Mean  StDev  SE Mean
0            12  22.8   11.9      3.4
1             7  -8.3   24.4      9.2

Difference = mu (0) - mu (1)
Estimate for difference:  31.04
90% CI for difference:  (12.41, 49.66)
T-Test of difference = 0 (vs not =): T-Value = 3.16  P-Value = 0.016  DF = 7
```

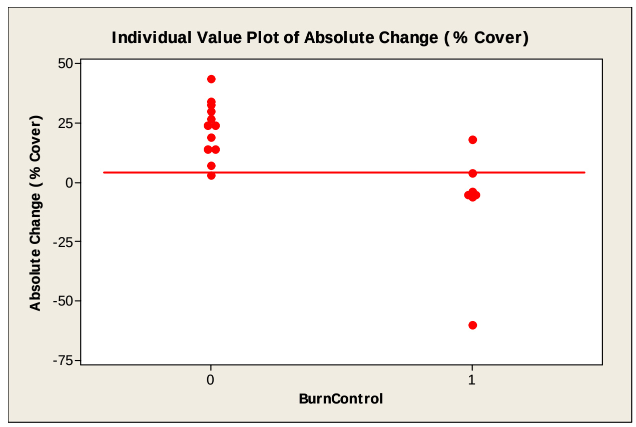
One-way ANOVA: Absolute Change (% Cover) versus BurnControl

```
Source       DF    SS    MS      F      P
BurnControl   1  4258  4258  14.13  0.002
Error        17  5124   301
Total        18  9382

S = 17.36   R-Sq = 45.39%   R-Sq(adj) = 42.18%


                         Individual 95% CIs for Mean Based on
                         Pooled StDev
Level   N   Mean  StDev  -----+---------+---------+---------+----
0      12  22.75  11.92                       (------*------)
1       7  -8.29  24.36  (--------*---------)
                         -----+---------+---------+---------+----
                            -15         0        15        30

Pooled StDev = 17.36
```

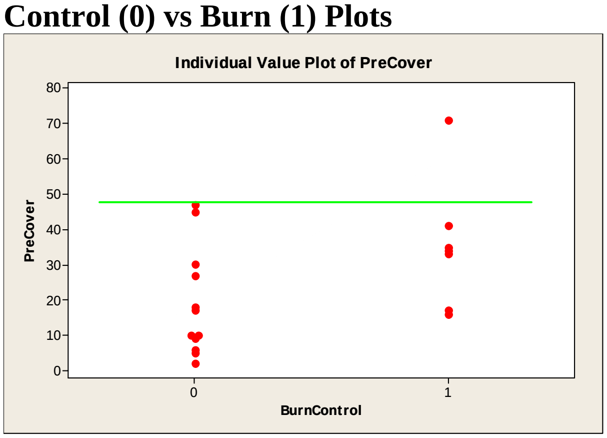
% Change in ARCA Cover in Individual Plots from PRE to YR10



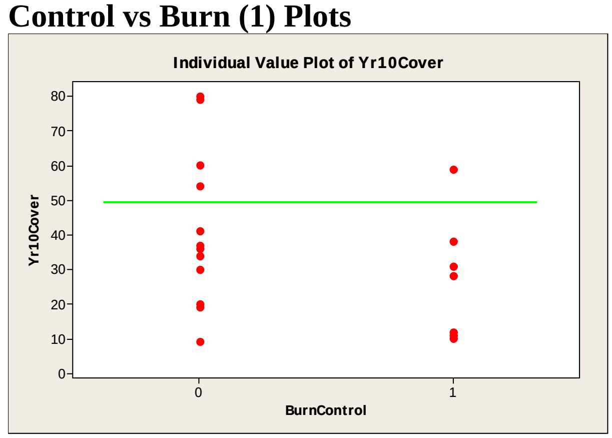
Absolute Change in % ARCA Cover in Individual Plots from PRE to YR10



PRE % ARCA Cover in Control (0) vs Burn (1) Plots



YR10 % ARCA Cover in Control vs Burn (1) Plots



CHIS SRI ARCA Plots
Change in ARCA density, Control=0, Burn = 1

Two-Sample T-Test and CI: 00 PRE Total, Burn Control

```
Two-sample T for 00 PRE Total

Burn
Control   N   Mean  StDev  SE Mean
0        14   61.0   27.1      7.2
1         7  57.57   7.96      3.0

Difference = mu (0) - mu (1)
Estimate for difference:  3.43
95% CI for difference:  (-13.19, 20.05)
T-Test of difference = 0 (vs not =): T-Value = 0.44  P-Value = 0.668  DF = 16
```

Two-Sample T-Test and CI: %change density, Burn Control

```
Two-sample T for %change density

Burn
Control   N    Mean  StDev  SE Mean
0        14   0.005  0.468     0.13
1         7  -0.408  0.338     0.13

Difference = mu (0) - mu (1)
Estimate for difference:  0.413
95% CI for difference:  (0.034, 0.792)
T-Test of difference = 0 (vs not =): T-Value = 2.31  P-Value = 0.035  DF = 16
```

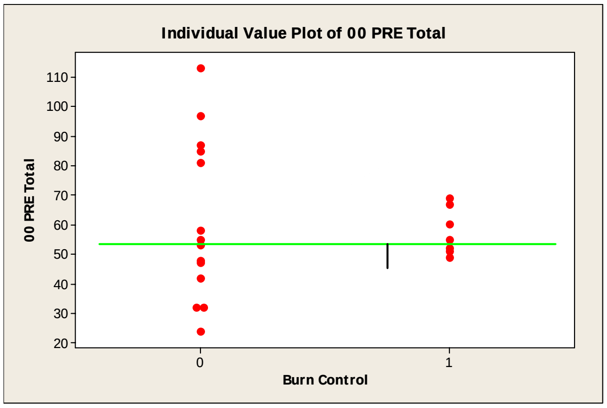
One-way ANOVA: %change density versus Burn Control

```
Source        DF     SS     MS     F      P
Burn Control   1  0.795  0.795  4.27  0.053
Error         19  3.536  0.186
Total         20  4.331

S = 0.4314   R-Sq = 18.37%   R-Sq(adj) = 14.07%

                            Individual 95% CIs for Mean Based on Pooled StDev
Level   N     Mean   StDev     +---------+---------+---------+---------
0      14   0.0048  0.4681                          (--------*---------)
1       7  -0.4080  0.3384     (-------------*------------)
                               +---------+---------+---------+---------
                            -0.75     -0.50     -0.25      0.00

Pooled StDev = 0.4314
```

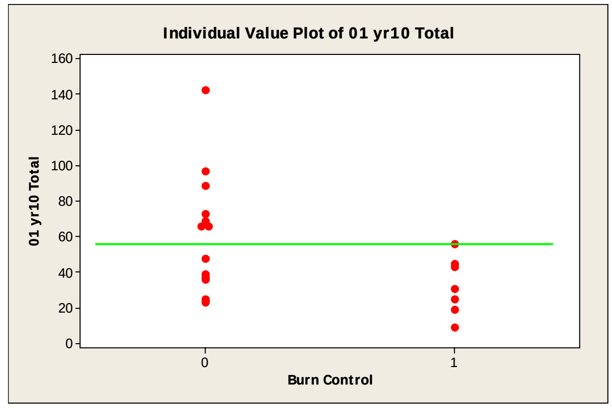
Two-Sample T-Test and CI: 01 yr10 Total, Burn Control

```
Two-sample T for 01 yr10 Total

Burn
Control   N  Mean  StDev  SE Mean
0        14  59.6   34.0      9.1
1         7  32.6   16.4      6.2

Difference = mu (0) - mu (1)
Estimate for difference:  27.1
95% CI for difference:  (4.0, 50.2)
T-Test of difference = 0 (vs not =): T-Value = 2.46  P-Value = 0.024  DF = 18%
```

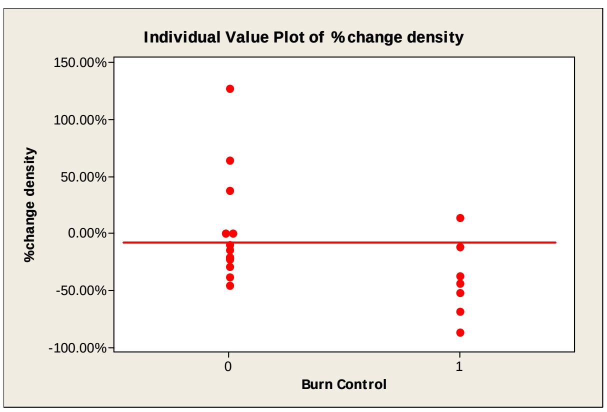
PRE ARCA Density in Control (0) vs Burn (1) Plots



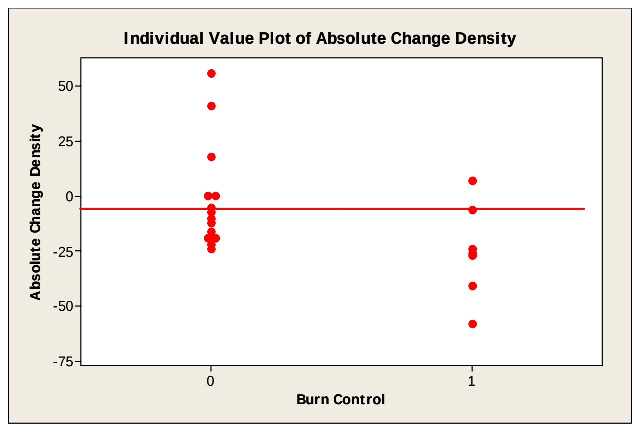
YR10 ARCA Density in Control (0) vs Burn (1) Plots



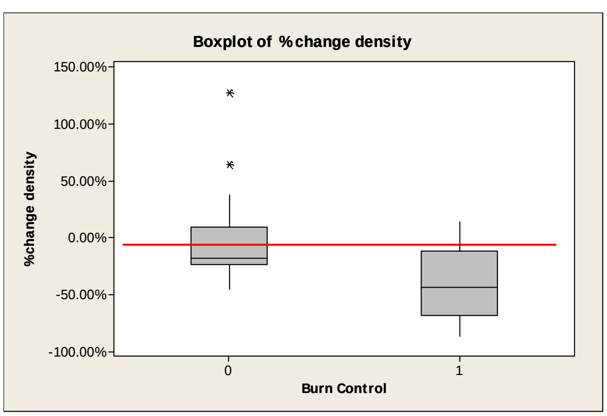
% Change in ARCA Density in Individual Plots from PRE to YR10



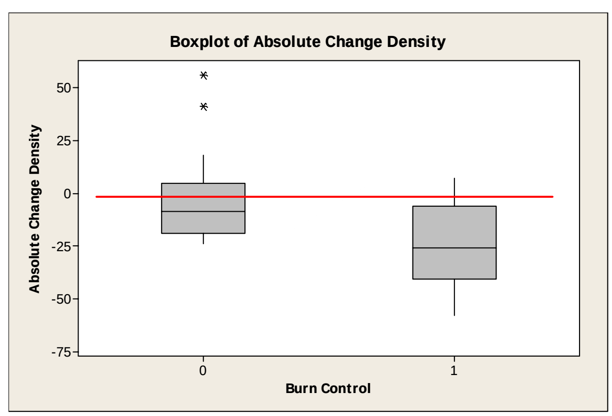
Absolute Change in ARCA Density in Individual Plots from PRE to YR10



% Change in ARCA Density



Absolute Change in % ARCA Density



CHIS SRI NAPU Plots
Change in NAPU cover

Descriptive Statistics: PreCover

Variable	BurnControl	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median
PreCover	0	10	0	32.40	4.84	15.30	10.00	20.50	34.00
	1	9	0	18.78	2.78	8.35	10.00	11.50	16.00

Variable	BurnControl	Q3	Maximum
PreCover	0	43.75	56.00
	1	26.50	34.00

Two-Sample T-Test and CI: PreCover, BurnControl

Two-sample T for PreCover

BurnControl	N	Mean	StDev	SE Mean
0	10	32.4	15.3	4.8
1	9	18.78	8.35	2.8

```
Difference = mu (0) - mu (1)
Estimate for difference:  13.62
95% CI for difference:  (1.65, 25.59)
T-Test of difference = 0 (vs not =): T-Value = 2.44  P-Value = 0.029  DF = 14
```

Descriptive Statistics: Yr10Cover

Variable	BurnControl	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median
Yr10Cover	0	10	0	57.70	3.00	9.49	41.00	50.25	59.50
	1	9	0	49.11	8.47	25.42	4.00	27.00	58.00

Variable	BurnControl	Q3	Maximum
Yr10Cover	0	67.50	69.00
	1	69.00	80.00

Two-Sample T-Test and CI: Yr10Cover, BurnControl

Two-sample T for Yr10Cover

BurnControl	N	Mean	StDev	SE Mean
0	10	57.70	9.49	3.0
1	9	49.1	25.4	8.5

```
Difference = mu (0) - mu (1)
Estimate for difference:  8.59
95% CI for difference:  (-11.74, 28.92)
T-Test of difference = 0 (vs not =): T-Value = 0.96  P-Value = 0.364  DF = 9
```

Descriptive Statistics: % change

Variable	BurnControl	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median
% change	0	10	0	1.581	0.405	1.282	-0.938	0.781	1.625
	1	9	0	1.896	0.447	1.340	-0.750	1.031	1.813

Variable	BurnControl	Q3	Maximum
% change	0	2.641	3.500
	1	3.063	3.438

Two-Sample T-Test and CI: % change, BurnControl

Two-sample T for % change

BurnControl	N	Mean	StDev	SE Mean
0	10	1.58	1.28	0.41
1	9	1.90	1.34	0.45

Difference = mu (0) - mu (1)
Estimate for difference: -0.315
95% CI for difference: (-1.593, 0.964)
T-Test of difference = 0 (vs not =): T-Value = -0.52 P-Value = 0.609 DF = 16

Descriptive Statistics: Absolute Change % Cover

Variable	BurnControl	N	N*	Mean	SE Mean	StDev	Minimum
Absolute Change % Cover	0	10	0	25.30	6.48	20.51	-15.00
	1	9	0	30.33	7.15	21.44	-12.00

Variable	BurnControl	Q1	Median	Q3	Maximum
Absolute Change % Cover	0	12.50	26.00	42.25	56.00
	1	16.50	29.00	49.00	55.00

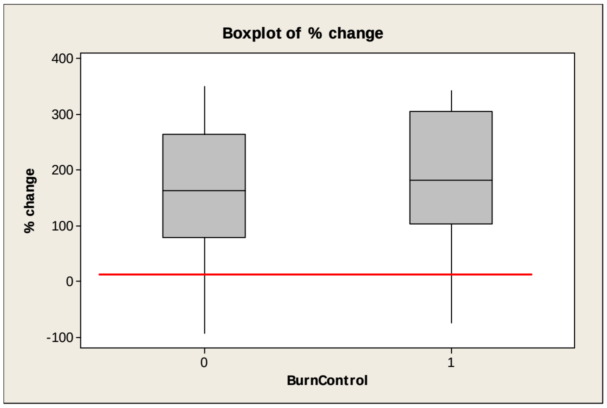
Two-Sample T-Test and CI: Absolute Change % Cover, BurnControl

Two-sample T for Absolute Change % Cover

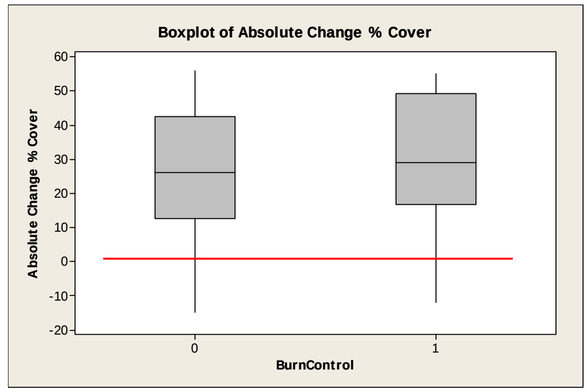
BurnControl	N	Mean	StDev	SE Mean
0	10	25.3	20.5	6.5
1	9	30.3	21.4	7.1

Difference = mu (0) - mu (1)
Estimate for difference: -5.03
95% CI for difference: (-25.49, 15.42)
T-Test of difference = 0 (vs not =): T-Value = -0.52 P-Value = 0.609 DF = 16

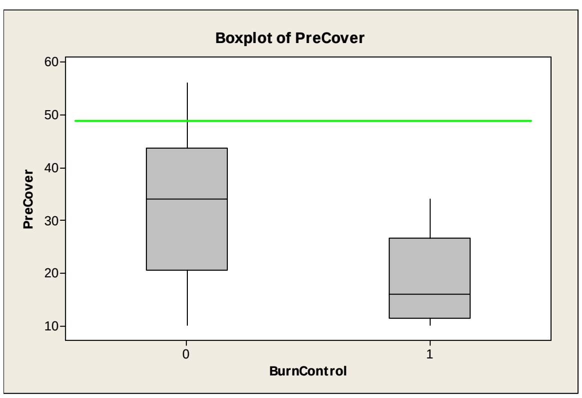
% Change in NAPU Cover from PRE to YR10



Absolute Change in % NAPU Cover from PRE to YR1



PRE % NAPU Cover in Control (0) vs Burn (1) Plots



YR10 % NAPU Cover in Control vs Burn (1) Plots