



**National Park Service
San Francisco Bay Area Network
Fire Ecology Annual Report
Calendar Year 2010**

**Golden Gate National Recreation Area
Pinnacles National Monument
Point Reyes National Seashore**

A. Summary

During 2010, the San Francisco Bay Area Network (SFBAN) Fire Ecology and Fire Effects program worked closely with both Fire Management and Natural Resources Management on a number of projects aimed at natural resource benefit. At Golden Gate National Recreation Area, monitoring and treatment implementation was carried out for an NRPP project which explored the use of disturbance to restore habitat for the federally endangered mission blue butterfly. At Pinnacles National Monument, monitoring was focused on two prescribed burn projects aimed at yellow starthistle reduction. A Joint Fire Science grant was awarded to an interagency group lead by Pinnacles NM to study the Native American use of fire in the central coast region of California. At Point Reyes National Seashore, monitoring was carried out on several Scotch and French broom reduction fires.

The Fire Effects Crew monitored over 75 SFBAN plots. In addition, the crew assisted with fire effects monitoring efforts at Channel Islands National Park, Santa Monica Mountains National Recreation Area and Lassen Volcanic National Park. The Fire Effects Crew and Fire Ecologist assisted with prescribed burns at Golden Gate NRA, Pinnacles NM and Point Reyes NS.

**Right: Fire Effects Monitoring Crew
doing immediate post-burn monitoring at
Pinnacles National Monument.**



Mission Blue Butterfly Habitat Restoration

The focus of the Fire Ecology and Fire Effects program at Golden Gate NRA in 2010 was a project lead and funded by the Natural Resources Management division to restore habitat for the federally endangered Mission blue butterfly (*Icaricia icarioides missionensis*). This species is found in coastal prairie grasslands that occur primarily within Golden Gate National Recreation Area (GGNRA). The mission blue relies on a few species of disturbance associated lupine as host plants. This project is focused at comparing the effects of various treatments (fire, mechanical disturbance and no treatment) on lupine regeneration and butterfly populations.

Fire and mechanical treatments took place on small experimental plots in the Marin headlands and at Milagra Ridge in San Mateo County. Monitoring plots used an FMH design modified to accommodate small treatment plots and project-specific monitoring questions. Fire treatments were implemented using 2.5m by 2.5m steel burn boxes. Year one post-burn monitoring will take place in the summer of 2011.

This project was covered extensively in the local media including an article in the [Marin Independent Journal](#) and a [KQED public radio feature](#).



Left: Fire treatment implementation using burn boxes in the Marin headlands at Golden Gate National Recreation Area

Using Fire to Control Yellow Starthistle

Prescribed fire projects at Pinnacles National Monument in 2009 and 2010 have been focused on controlling yellow starthistle (*Centaurea solstitialis*) primarily on lands acquired by Pinnacles NM in 2006. The areas treated were dominated by yellow starthistle, mustard, and non-native annual grasses. Fire is being used in combination with mowing and/or herbicide application. Several small demonstration areas within the restoration area will be seeded with native species following treatment.

Initial monitoring results are highly variable and there was not a statistically significant change in starthistle cover or density in the first year following fire. However, fire is expected to stimulate germination from the starthistle seedbank and follow-up treatment using herbicide was implemented. Monitoring results from 2011 should be more indicative of project success.

Informal observation suggests that *Leymus triticoides*, a native perennial grass, may have increased in cover and extent following the prescribed burn.

Exploring Native American Use of Fire in Central Coastal California

A collaborative project led by Pinnacles National Monument staff, **Exploring the Traditional Use of Fire in the Coastal Mountains of Central California**, was recently funded by the Joint Fire Science Program. This project will bring together members of the Amah Mutsun Tribal Band, resource managers from the NPS and BLM, and academics to reconstruct anthropogenic fire regimes in central coastal California prior to European settlement. A new fire history methodology will be developed focusing on phytoliths, which are silica particles found in plant cells that remain in the soil for hundreds or thousands of years as records of fire. In addition, in the fall of 2011, fire will be reintroduced to a traditional gathering ground in Pinnacles National Monument in collaboration with the Amah Mutsun Tribal Band. This prescribed fire will be used to improve the quality of white root sedge and deergrass stands for basketry materials.



Left: Deergrass stand at Pinnacles National Monument; Right: Prescribed burn to control Scotch broom at Point Reyes National Seashore.

Using Fire to Control Scotch Broom

The Fire Effects and Fire Ecology program also worked closely with Point Reyes National Seashore Natural Resource Management staff in 2010 on an NRPP funded project using multiple techniques to control Scotch broom (*Cytisus scoparius*). Scotch broom is a highly invasive leguminous shrub which spreads quickly and can convert native grass and shrub habitat into dense broom monocultures. Prescribed fire can be an effective tool for Scotch broom treatment if the initial treatment is followed with subsequent treatments (fire, chemical or mechanical treatment). The initial treatment stimulates germination from the seedbank which requires initial follow up but decreases the amount of long term control effort needed. For this project, plots were installed in prescribed burn, mechanical, chemical and control treatment areas and a fall prescribed burn was successfully implemented.

Table 1. Fire Effects Plot Workload (2010) and Total Plots Installed

Park	Monitoring Unit	Type of Plot (FMH, photo point, other)	Pre-burn 2010	Immed. Post 2010	Postburn (1-20 yrs) 2010	Total Plots
Golden Gate NRA	Mission Blue Butterfly	Modified FMH	8	8		8
Pinnacles NM	Yellow starthistle	FMH; Other		3	18	18
Point Reyes NS	Non-native annual grassland	FMH			9	36
	Non-native perennial grassland	FMH			7	7
	Scotch Broom	Modified FMH	17	4		17
	French Broom	FMH		11		13
	<i>Deschampsia</i> prairie	FMH			7	7
	Bishop pine	FMH			6	6
	Eucalyptus	Modified FMH			5	5
Total			25	26	52	170*

*Includes monitoring types not listed in this table.

Table 2. Fire Ecology Staffing 2010

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ Qualified (Yes or No)	Training and Development
Alison Forrestel	NA	NA	26	Trainee	FMO conference, SOD Science Symposium
Wende Rehlaender	2/14/10	11/27/10	20.5	No	Crucial conversations
Rosa Schneider	4/16/10	8/20/10	9	No	S-130/190
Forest Taipale	4/16/10	9/9/10	10.5	No	S-290

Table 3. Management Objectives and Monitoring Results

All results shown are 90% confidence intervals of the mean. Objectives/results are mean percent change from pre-burn to most recent post-burn visit.

Golden Gate NRA

Monitoring Unit	Management Objective (Restoration)	Monitoring Results (90% confidence interval)	Objective Achieved?	Year Last Analysis Completed
Redwood Forest	Reduce Fuel Loads	No significant difference between pre-fire fuel loads and year 10 post-fire fuel loads. Fuel loads did decrease significantly in YR01, but by YR02 had returned to pre-fire levels. (<i>n</i> =8 plots, 3 fires)	NO* *But results confounded by 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 loads.	2008

Pinnacles NM

Monitoring Unit	Management Objective (Restoration)	Monitoring Results (90% confidence interval)	Objective Achieved?	Year Last Analysis Completed
Chamise chaparral	Enhance native vegetation* * 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.	-30% to +21% change in native species absolute cover (n=7 plots, 3 fires)	NO	2007
Yellow starthistle FMH	95% reduction in yellow starthistle cover	-14% to +3.5% change in yellow starthistle cover (n=5 plots, 1 fire)	NO	2011
	Maintain or decrease non-native species cover	-3% to +1% change in non-native species absolute cover (n=5 plots, 1 fire)	YES	2011
Yellow starthistle modified plots	95% reduction in yellow starthistle cover	-12% to -3% change in yellow starthistle cover (n=10 plots, 1 fire)	NO	2011
	95% reduction in yellow starthistle density	-110% to 539% change in yellow starthistle density (n=10 plots, 1 fire)	NO	2011
	Maintain or decrease non-native species cover	-16% to +3% change in non-native species cover (n=10 plots, 1 fire)	NO	2011

Point Reyes NS

Monitoring Unit	Management Objective (Restoration)	Monitoring Results (90% confidence interval)	Objective Achieved?	Year Last Analysis Completed
Non-native grassland (D Ranch)	Increase cover of <i>Bromus carinatus</i>	-5% to +21% change in BRCA (n=6 plots, 2 fires)	NO	2011
	Increase cover of native species	-7% to +10% change in native species cover (n=6 plots, 2 fires)	NO	2011
Non-native perennial grassland	Decrease cover of <i>Baccharis pilularis</i>	5% mean decrease in BAPI cover for burn plots compared to 8% increase in BAPI cover for control plots*	YES	2011
	Maintain or decrease cover of <i>Phalaris aquatica</i>	27% mean decrease in PHAQ cover for burn plots compared to 37% decrease in PHAQ cover for control plots** (n=7 plots, 1 fire)	NO	2011

Monitoring Unit	Management Objective (Restoration)	Monitoring Results (90% confidence interval)	Objective Achieved?	Year Last Analysis Completed
	Maintain or increase cover of native species	3.5% mean decrease in native cover for burn plots compared to 7% increase in cover for control plots* (<i>n=7 plots, 1 fire</i>)	NO	2011
<i>Deschampsia</i> prairie	Maintain or increase cover of native species	21% to 28% decrease in native species cover. Decrease is also statistically significant when compared to control plots. (<i>n=7 plots, 1 fire</i>)	NO	2011
Bishop pine	Maintain or increase cover of native species	Minimum of 2% decrease in native species cover in a one-sided test. Mean decrease of 20%. (<i>n=3 plots, 1 fire</i>)	NO	2011
French broom	Decrease cover of French broom to 10% or less	9% to 22% decrease in French broom cover; mean post broom cover 0% to 14% (<i>n=3 plots, 4 fires</i>)	NO	2011
	Maintain or increase cover of native species	6% to 15% decrease in native species cover (<i>n=3 plots, 4 fires</i>)	NO	2011
Scotch broom	Decrease cover of Scotch broom to 10% or less	0% to 3% cover in Scotch broom (<i>n=6 plots, 3-5 fires</i>)	YES	2008
	Maintain or increase cover of native species	2% to 16% decrease in native species cover (<i>n=6 plots, 3-5 fires</i>)	NO	2011
Eucalyptus	Decrease standing BA of eucalyptus	811-4315cm ² decrease in BA (<i>n=5 plots, mechanical</i>)	YES	2008
	Decrease dead and downed fuel loads	No statistically significant change in fuel loading (<i>n=5 plots, mechanical</i>)	NO	2008
	Minimize resprouts	-10% to +75% change in resprouts from initial post treatment to 5 years post-treatment (<i>n=5 plots, mechanical</i>)	NO	2011

* Statistically significant at $\alpha=0.10$

** NOT Statistically significant at $\alpha=0.10$

B. Fire ecologist accomplishments and areas of focus

Table 4. Fire Ecologist Accomplishments/Focus Areas

Category	Percent Time	Accomplishments and/or areas of activities
<i>Planning</i>	<i>10%</i>	• <i>Completed PINN READ kits and maps</i> • <i>Assisted with planning for prescribed fire and fuels project at all parks</i>
<i>Presentations</i>	<i>2%</i>	• <i>Attended SOD science symposium</i> • <i>Presented poster at I&M science symposium</i> • <i>Coordinated climate change and vegetation brown bag at PORE & GOGA</i>
<i>NPS Meetings/ task groups</i>	<i>15%</i>	• <i>Hosted Fire Effects Forum</i> • <i>Hosted fire-RM meetings for network parks</i> • <i>Participated in I&M Plant Community Change working group</i> • <i>Assisted national office with FFI</i> • <i>Attended FMO meeting in San Antonio</i>
<i>Interagency work</i>	<i>2%</i>	• <i>Assisted FMO with WFDSS implementation for PORE, PINN & GOGA</i> • <i>Assisted FMO with FPA workload</i>
<i>Wildfire assignments</i>	<i>0</i>	
<i>Prescribed fire projects</i>	<i>15%</i>	• <i>Designed and implemented monitoring for mission blue butterfly project; coordinated implementation of fire treatment</i> • <i>Wrote burn plans for mission blue butterfly prescribed burn and estero Scotch broom prescribed burn</i> • <i>Assisted with prescribed burn implementation at network parks</i>
<i>Non-fire fuels projects</i>	<i>0</i>	
<i>Research</i>	<i>8%</i>	• <i>Submitted SCC grant to USFS Forest Health fund source for PINN</i> • <i>\$240,000 grant funded by JFSP to work on traditional use of fire at PINN</i> • <i>\$10,000 STRL grant funded for SOD/fire work at PORE/MMWD</i> • <i>Submitted NPS Fire Research grant proposal for SOD/fire work at PORE/GOGA</i> • <i>Submitted research proposal for SOD/owls/fire to the USFS</i>
<i>Data collection</i>	<i>8%</i>	• <i>Assisted with FMH data collection when available</i>
<i>Data entry</i>	<i>0</i>	
<i>Data analysis</i>	<i>15%</i>	
<i>Supervision/Admin</i>	<i>20%</i>	• <i>Hiring, supervision, payroll, travel authorization/vouchers, purchasing, etc.</i>
<i>Training</i>	<i>0</i>	
<i>Miscellaneous</i>	<i>5%</i>	• <i>Provided GIS assistance to fire staff & others when needed</i> • <i>Updated fire history and mechanical treatments layers with 2010 fires/treatments</i> • <i>Taught GIS class for cultural resources</i>

C. Fire effects crew accomplishments and areas of focus

Table 5. Fire Effects Crew Accomplishments/Focus Areas

Category	Crew	Lead	Notes
<i>FMH plots</i>	35%	13%	
<i>Other plot work</i>	10%	5%	<i>Includes plots using other monitoring protocols</i>
<i>Prescribed fire projects</i>	<1%	3%	<i>Lead Monitor was FEMO on five prescribed burns, 1 at PINN, 1 at GOGA, and 3 at PORE. Four burns were 1 day, and one was 2 days. Seasonals observed for the one burn they were present for. Lead was FEMO trainer for an engine crew member.</i>
<i>Non-fire fuels projects</i>	4%	3%	<i>Photomonitoring of thinning projects.</i>
<i>Data entry</i>	35%	30%	<i>Completed data entry of all plot data for 2010. Includes FFI database management, photo management and keying voucher specimens.</i>
<i>Supervision/Admin</i>	0%	35%	<i>Lead monitor hired and supervised two monitors; misc travel and time paperwork</i>
<i>Training</i>	15%	11%	<i>Fire refresher, training and development as noted in previous table, regular PT.</i>

D. Additional Information

Table 6. Data Entry and Projects Monitored

Park	% 2010 Data Entered	% 2010 Data Quality Checked	# Prescribed Fires Monitored*	# Non-fire Fuels Treatments Monitored*	# Wildfires Monitored*	# BAER Treatments Monitored*
Golden Gate National Recreation Area	100%	100%	1	1	0	0
Pinnacles National Monument	100%	100%	1	0	0	0
Point Reyes National Seashore	100%	100%	7	1	0	0

* Number of treatment units with treatment effects monitoring conducted. Include pre-burn and post-burn monitoring but not burn-day monitoring.

E. Optional Information

Monitoring Activities Narrative

Overview

The season began in mid-April, and the crew jumped right in to sampling Mission Blue Butterfly plots at Golden Gate (GOGA). The first trip was to Pinnacles (PINN), which was a little tricky to schedule, due to late rain and delays in herbicide spraying at that park. We escaped with only a little rain falling on us though. We got the PINN work done in time to rush back and have a little time at home before departing for a long trip to southern California in May. We went south for a tour at Channel Islands, on Santa Cruz Island. We also had work to do at Santa Monica Mountains (SAMO), so got one day of field work in at SAMO when the boat to the island was delayed for a day, and finished up after completing our island tour.

In June and the first half of July, we were busy with field work, data entry, and other projects at Point Reyes (PORE). We also traveled back to PINN to participate in the Entrance Meadow prescribed burn. In the second half of July we traveled north to assist the Southern Cascades fire effects crew at Lassen Volcanic National Park. In August and September we continued field and office work at our home parks, and participated in the first Mission Blue Butterfly burn box burn. Both seasonals left early this year, as both had had educational commitments that were in place when they were hired (one left to pursue a masters' degree in biology, and the other had enrolled in a bicycle repair training).

After the crew departed, the lead monitor participated in the three prescribed burns that were carried out at PORE, and also helped an engine crew member to complete portions of his FEMO taskbook.

Channel Islands National Park

This year we visited Santa Cruz Island to read plots that had been established in 2004 for the Del Norte prescribed burn. This burn was never executed, but changes have occurred since 2004:

the feral pigs that had plagued the island were removed, and the vegetation has been recovering. The Del Norte burn had been planned as part of an effort to combat the large infestation of fennel (*Foeniculum vulgare*) that exists on this part of the island. The pigs and fennel had a positive-feedback relationship, so park biologists were interested to see what the condition of the vegetation was now that it has had several pig-free years. The Del Norte plots were a great chance to examine this question (since they were first read while the pigs were still there), while making use of never-burned (and basically abandoned) plots. We were able to find and read twenty of the plots during our stay on the island. On mixed fennel plots there were dramatic increases in cover of native shrub species, while plots in other monitoring types showed fewer alterations. Analysis of the data is planned.

Golden Gate National Recreation Area

At Golden Gate, the Mission Blue Butterfly (MBB) plots were re-read, because last year they were read so late in the season. In addition, one of the plots at Milagra Ridge turned out not to be on park land, and one in the Marin Headlands was deemed too steep by a park scientist. Having to throw out our work was a little sad, since we had been directed where to locate the plots by GOGA staff. A new plot was established at Milagra Ridge to replace the one removed.

The MBB plots contained three blocks: mechanical removal, burn, and control. The vegetation was scraped from the mechanical blocks of the plots by GOGA park staff, and in August (for Marin Headlands) and September (for Milagra Ridge) fire was applied to the burn blocks. The burn boxes constructed last year were used to contain the fire when the blocks were burned. There was strong media interest in the burn. The burns went well, the only drawback being the weight of the burn boxes. The boxes were made of steel plates assembled into boxes approximately three meters wide on a side, and 1½ meters tall. The burn blocks were 15m x 5m, so the boxes had to be moved several times in order to completely blacken each burn block. The MBB burns were the first burns (aside from piles and tiny burn boxes) done at GOGA since 1998.

Lassen Volcanic National Park

As we have since 2005, we again helped the Southern Cascades Fire Effects Crew, whose workload again exceeded their staffing. This year we joined them at Lassen for a pay period, and enjoyed working and swimming at Butte Lake. The six of us—Todd and his two seasonals, and our PORE crew of three—all worked together on each plot. We got a lot accomplished, reading a total of 24 plots in the six field days. Reading forest plots in the mountains is a change of pace for us, and we enjoy that and also the chance to work with some new people. The plots read were:

- 9 ABCO (*Abies concolor*)
- 4 PIPO (*Pinus ponderosa*)
- 9 aspen (*Populus tremuloides*)

Pinnacles National Monument

The FEM crew made two trips to Pinnacles, one to read plots, and one to participate in a prescribed burn. In the Bottomlands unit, we re-read the CESO (*Centaurea solstitialis*, or yellowstar thistle) plots that burned last year (these are traditional 30-meter FMH transects). We also re-read the YST plots that we installed last year in the Bottomlands unit. The YST plots are

also dominated by yellowstar thistle, but are laid out in an alternate design, designated by Brent Johnson, the PINN Botanist. Herbicide was applied to the starthistle this year, so scheduling of the monitoring trip was a little trickier, as we had to wait after the spraying was carried out, which itself depended on environmental conditions being right. We were assisted at PINN on the last few days by PINN staff. This assistance enabled us to finish our work in the allotted time.

The Entrance Meadow unit was slated to be burned this year, so we read the three CESO plots in this unit before the burn, as well as the two control plots. One of the three CESO control plots had already been obliterated when the park carried out a construction project. After the remaining two CESO control plots had been read, they were churned up by heavy equipment driving over them. They have been rejected.

The Entrance Meadow burn was carried out on June 16, and went very well. The lead monitor was the FEMO, and the two seasonals observed the burn (one had not yet completed S-130/S-190). This was the second burn at Pinnacles in two years, after a period of ten years with no burning in the park at all.

Point Reyes National Seashore

At Point Reyes, plots in a number of burn units were due to be read, despite the scarcity of burns in the last couple of years. The *Deschampsia* (hairgrass) and PIMU (Bishop pine, brush method) plots received their year 02 read, and eucalyptus mechanical removal and two sets of grassland plots were read at year 05.

The Scotch broom (*Cytisus scoparius*) in the park, which is of relatively localized extent, is currently being addressed with a systematic attack. Methods to be tested for their effectiveness in controlling Scotch broom are burning, mechanical removal, and application of herbicide. A new set of 15m transects (regular FMH methods, except for the transect length) was established this year to monitor the effects of these treatments; the set of plots also included controls. Eight existing 30m transects were incorporated into this sampling effort. In October a small burn was done, and four of the CYSC plots were in this burn unit. The broom had been cut several months earlier, and burned very well (despite a little rain that preceded the burn). Also burned this year were all of the French broom (*Genista monspessulana*) plots, which are spread between two burn units. In addition, pictures were re-taken at photopoints, to monitor mechanical fuel reduction projects being carried out by the Hazard Fuel Crew. The lead monitor was able to assist with for day with hand-pulling of a Category 1 noxious weed at PORE (fertile capeweed, *Arctotheca calendula*), and two days to monitor an endangered species (*Chorizanthe vallisida*, the one occurrence of which is at PORE), and its plant community.

Santa Monica Mountains National Recreation Area

The PORE crew made one trip to SAMO and conducted year 05 reads of shrub plots burned in the 2005 Topanga Fire. The rest of the fire effects work done at SAMO will be detailed in the report submitted by the Mediterranean Network.

INSTRUCTIONS FOR UPLOADING 2010 ANNUAL REPORT

1. Save your report as a PDF file using the following file naming convention “2010 *Park/Network Name* Annual Report.pdf”.
2. Go to the NPS Fire Ecology Sharepoint site (<http://npsfamshare.nps.doi.net/wildlandfire/firescience/fireecology/default.aspx>). In Fire Ecology Documents, upload your report to the 2010 Park and Network Fire Ecology Program Annual Reports folder.
3. Please e-mail your regional ecologist, Nate Benson, and MaryBeth Keifer to let us know when you get your report uploaded.

Call MaryBeth Keifer (603-795-2333) or Nate Benson (208-387-5219) if you have any questions or problems.