



**National Park Service
San Francisco Bay Area Network
Fire Ecology Annual Report
Calendar Year 2012**

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

A. Summary

The year 2012 was a year of changes for the San Francisco Area Network (SFAN) Fire Ecology Program. The Fire Ecologist, Alison Forrestel, left to take a promotion. This year was also the last year (for an unknown while at least) that we'll have a seasonal crew. Two great employees from last year returned, so we went out with a bang. In October, with the start of FY13, the Lead Monitor was moved from a supervisory chain under Resource Management, to working directly for the Fire Management Officer, within the Protection division. Her position title was changed from Biotech (Fire Effects) to Biotech (Forestry). As of this writing (11-30-12), her duties have not yet been presented in the form of a work plan or performance standards, but could be quite changed when she returns from furlough in April. Thus, the fire ecology/effects program, in the words of the FMO, has been "dissolved" in the SFAN network. Monitoring needs, however, continue.

When 2012 began, Alison was detailing into the job she later accepted. After finishing her detail she returned to the park on February 24, and then departed for the new job on April 6. The fire effects program misses her greatly, but we wish her the best in her new position as Vegetation Branch Chief at Golden Gate NRA.

Kristen Shive was an emergency hire as the fire ecologist for 60 days, from May 20 to July 19. During this time she completed some preliminary data analysis, developed sampling methods for a set of plots, and participated in field work.

The Lead Monitor, Wende Rehlaender, returned from furlough in mid-January 2012, and worked through November. Her 2012 work plan differed from other years, in two areas: she did some of the tasks the fire ecologist ordinarily would have, and she participated in a number of rare plant surveys for Point Reyes NS.

The seasonal crew, Monica Delmartini and Jenny Cribbs, worked from mid-April until the end of the fiscal year. It was great to have two competent hard-working employees who were already experienced with the methods and the parks.

Fire Effects Monitoring

In 2012, the SFAN fire effects crew worked in seven parks in two networks. For the first time, the crew did not travel to southern California parks, but did continue, for the eighth straight year, to assist the Klamath Network (KLMN) parks.

San Francisco Area Network

At Golden Gate National Recreation Area (GOGA), year-2 reads were done of the Mission Blue Butterfly plots, to monitor the effects of burning and cutting on habitat for this endangered butterfly. Also at GOGA, the park's Restoration Ecologist had asked that a small unit be burned to control French broom. Five 15-meter plots were installed, read, and burned.

Pinnacles National Monument had few monitoring needs this year; a half day only was required to read three yellow starthistle plots in the Entrance Meadow unit.

At Point Reyes National Seashore (PORE), the crew read a large group of Scotch broom plots, which are being used to compare the effects of burn, mechanical, and chemical treatments on the control of Scotch broom. The park's Restoration Ecologist analyzed the data through 2011, and presented her results in a PORE "brown bag" talk. At PORE, the French broom plots (which have burned multiple times) were also read. Many French broom plots were slated to be re-burned this year, but the right conditions did not present themselves. This was possibly for the best, as preliminary analysis suggests that too-frequent burning has negative effects on the native plant species.

Klamath Network

The PORE acting fire ecologist and the seasonal crew made one week-long trip to Whiskeytown National Recreation Area, and another pay period-long trip to Redwood National Park (the lead monitor had other commitments during this time). The lead monitor entered all of the data collected in REDW and WHIS.

Starting in mid-July, the seasonal crew was committed to the Eastside KLMN parks, completing four back-to-back trips. Three of the trips were to Lassen Volcanic NP, and one was to Crater Lake NP.

Other Projects

The Lead Monitor was involved in a variety of projects that differed from her usual duties, as she:

- Wrote short reports for the three PORE wildfires.
- Took the initiative to submit a request for BAR funds for two park wildfires: mapped retardant, researched potential effects, wrote the report.

- Conducted rare plant surveys for PORE park maintenance projects and a fuels project.
- Participated in monitoring several species of rare plants at PORE.
- Mapped burned and mowed areas in the SFAN parks, updated the GIS layers and submitted the GIS data to the Regional Office
- Site visit to PINN for burn unit planning; reported back to FMO.
- Collected chinquapin leaves for USFS genetics lab.
- Updated plant species lists for GOGA, PORE, and Muir Woods, and incorporated new Jepson Manual names.

Table 1. Fire Effects Plot Workload (2012) and Total Plots Installed

Park	Monitoring Unit	Plot Type	Pre-burn 2012	Immed. Post 2012	Postburn (1-20 yrs) 2012	Annual Total (2012)	Total Plots
Golden Gate	Mission Blue Butterfly	Modified FMH			8	8	8
	French Broom	15m FMH brush plot	5	5		10	5
Pinnacles	Yellow Starthistle	FMH brush plot			3	3	18
Point Reyes	French Broom	FMH brush plot			13	13	13
	Scotch Broom	15m & 30m FMH brush plots			24	24	32
	Fuel Modification	Circular forest plot, 9m radius			5	5	5
	stands affected by SOD or pine pitch canker	photopoints				approx. 10	
Redwood	Mixed Prairie	FMH grass plot			4	4	38
	Oregon White Oak	FMH forest plot			6	6	26
Whiskeytown	Mixed Conifer	FMH forest plot			2	2	18
	Ponderosa Pine	FMH forest plot			2	2	6
	thinning treatment	photopoints				half-day's worth	
Crater Lake	Lodgepole Pine	FMH forest plot			9	9	9
	Mixed Conifer (White Fir)	FMH forest plot			2	2	24
	Whitebark Pine	Modified FMH transect	16			16	16
Lassen Volcanic	Mixed Conifer (White Fir)	FMH forest plot			2	2	36
	Lodgepole Pine	FMH forest plot			3	3	3
	Jeffrey Pine	FMH forest plot			2	2	2
	Aspen	Modified FMH forest plot	31			31	63
	Mixed Conifer	Modified FMH forest plot	39			39	39
	Riparian Meadow	Modified FMH forest plot	30			30	30
Total			121	5	85	211	

Table 2. Fire Ecology Staffing 2012

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ Qualified?	Training and Development
Alison Forrestel, Fire Ecologist	2-24-12	4-7-12	3	Yes	wilderness training
Kristen Shive, Acting Fire Ecologist	5-20-12	7-19-12	4½	Yes	Operational Leadership
Wende Rehlaender, Lead Monitor	1-15-12	12-1-12	23	Yes	Fire READ, Wilderness First Aid, wilderness training
Monica Delmartini, Seasonal Monitor	4-15-12	9-29-12	12	No	Wilderness First Aid, Operational Leadership
Jennifer Cribbs, Seasonal Monitor	4-15-12	9-29-12	12	No	Wilderness First Aid, Operational Leadership, S-290, started FEMO task book

Table 3. 2012 Management Objectives and Monitoring Results

The SFAN offers Appendices 1 and 2 in place of Table 3; please see below.

B. Fire ecologist accomplishments and areas of focus

The network currently lacks a fire ecologist, and time and distance precluded former employees from contributing to this section. Note that in 2012, the SFAN had a total of 7½ pay periods of fire ecologists' time.

Table 4. Fire Ecologist 2012 Accomplishments/Focus Areas

Both the fire ecologist and the temporary acting fire ecologist have moved on and were not available to complete this table. The lead fire effects monitor did her best, but had to make rough estimates in many cases. The accomplishments that are listed here may be incomplete.

Category	Percent Time		Accomplishments and/or areas of activities
	AF	KS	
Planning	15%	10%	
Presentations	5%		AF: presentation at PWR fire ecology meeting.
NPS Meetings/ task groups	10%		AF: PWR fire ecology meeting (2 days); Veg Branch retreat (½ day), possibly others?
Interagency work			unknown
Wildfire assignments			none
Prescribed fire projects			none
Non-fire fuels projects			none
Research			AF: unknown. KS: none
Data collection		30%	AF: none. KS: approx. 11 days
Data entry			
Data analysis	10%	20%	Estimated amount of time spent performing analyses, including data summaries and statistical tests.
Supervision/Admin	25%	15%	Hiring, supervision, payroll, etc.
Training	10%	10%	AF: Wilderness training (2 days). KS: Operational Leadership; fire refresher; park safety standown
Travel out-of-park for plot or project work		10%	AF: none. KS: 3-4 days.
Miscellaneous	25%	5%	Things that don't fit in other categories.

C. Fire effects crew accomplishments and areas of focus

Table 5. Fire Effects Crew 2012 Accomplishments/Focus Areas

Category	Percent Time		Notes
	Crew	Lead	
FMH plots	50%	10%	
WUI plots	-	-	All plots were pretty much WUI plots
CBI plots	0	0	
Other plot work	0	1%	Lead: 2 days of paleo-dune plots.
Wildfire assignments	2%	0	
Prescribed fire projects	<1%	<1%	One crew member participated in one park prescribed burn. Lead participated in one park Rx burn as FEMO.
Non-fire fuels projects	0	7%	Mechanical fuels reduction plots (and re-wrote metadata) and photopoints.
Travel out-of-park for plot or project work	13%	2%	Lead traveled to PINN for burn unit planning, and to YOSE for READ training.
Data entry	22%	20%	Crew completed data entry and checking of all SFAN plot data for 2012, and labeled digital photos. Lead went over data sheets, resolved unknowns, created FFI sample events, added species, and other tasks to manage databases. Lead entered data for REDW and WHIS.
Data analysis	0	1%	Lead extracted data for park staff, and made graphs.
Supervision/Admin	5%	25%	All reconciled credit cards, and misc. other tasks. Lead ordered things, wrote annual report, and various other administrative tasks.
Training	6%	5%	All attended Wilderness First Aid, fire refresher, and park safety training. Regular PT. Lead only: Fire READ, wilderness training
Miscellaneous	2%	28%	All attended one-day network science symposium. All pulled fertile capeweed for one day. Other accomplishments by Lead are described in Section A above.

D. Additional Program Information

Table 6. Planning - 2012

Park	Does Park have written DFCs? (yes or no)	Date Park-level Monitoring Plan completed (or revised)	Total # of Project- or Community-level Monitoring Plans (not just 2012)	Assisted with how many BAR plans in 2012?
Golden Gate National Recreation Area	No	No	1	0
Pinnacles National Monument	No	No	1	0
Point Reyes National Seashore	No	Dec. 2007	2	1

Table 7. Monitoring - 2012

Park	% 2012 Data Entered	% 2012 Data Quality Checked	# Prescribed Fires Monitored*	# Non-fire Fuels Treatments Monitored*	# Wildfires Monitored*	# BAER Treatments Monitored*
Golden Gate National Recreation Area	100%	100%	3	0	0	0
Pinnacles National Monument	100%	100%	1	0	0	0
Point Reyes National Seashore	100%	100%	several	1	0	0

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

Table 8. Communicating Results - 2012

Lack of time and information preclude completion of this table.

Table 9. Research - 2012

(table completed to the best of the Lead's knowledge)

Park	Are research needs identified in FMP or Monitoring Plan? (yes or no)	# of Proposals Submitted in 2012	# of Proposals Funded in 2012	# of Research Projects Supported in 2012*	Additional Comments
Golden Gate National Recreation Area	Yes	0	0	0	
Pinnacles National Monument	Yes	0	0	0	
Point Reyes National Seashore	Yes	0	0	0	

*Number of funded research projects, new or ongoing, supported by the fire ecology program including logistical info or support, staffing, etc.

E. 2013 Direction

Although the SFAN will be without a fire ecologist and a fire effects monitoring crew, the lead monitor will still be here, and is capable of reading plots alone, filling in where possible in fire ecology duties, and generally keeping an eye on the fuels treatment activities in the parks. She is also willing to travel to assist other networks in the region, and it sounds like plans are afoot to do that. Her tour of duty for FY2013, however, has been cut by seven pay periods, or one-third. The SFAN fire effects/ecology program has been hard-hit by funding cuts, going from approximately 72 pay periods of staffing, to 13. The lead monitor hopes for the best.

Although fire is not a common occurrence in the SFAN parks, these areas fall almost entirely within the wildland-urban interface. The parks are heavily used (and loved) by the public, are highly visible, and border many parcels of private land. Fuel-reduction treatments, whether through fire or mechanical means, will continue to be important components of land management in the SFAN parks. As such, it is hoped that funding for monitoring these treatments will continue.

F. Optional Information

Time precludes discussion of wish-list items for FFI, though there are several.

APPENDIX 1

Analysis Summary (organized by park and monitoring unit)

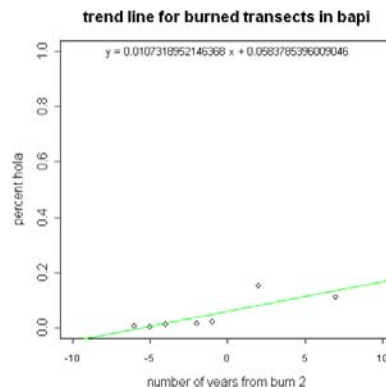
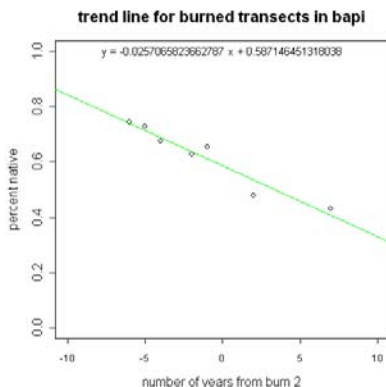
Written by Alison Forrestel, Fire Ecologist, San Francisco Area Network
March, 2012

- PORE

Overall conclusions: Although not conclusive, there is evidence that fire leads to decreased native cover in most of our vegetation types. Unless fire has a clear benefit (ie broom control with follow-up), prescribed burning should be used with caution in these vegetation types. There are vegetation types that clearly need fire to persist: maritime chaparral, bishop pine forest, but we are not currently treating those types.

- o BAPI – Northern coastal scrub

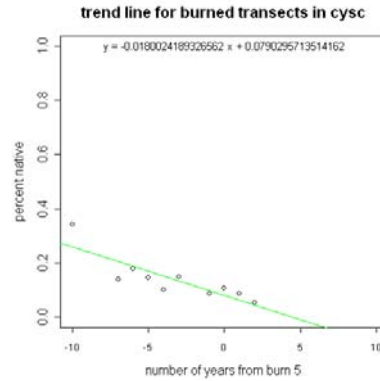
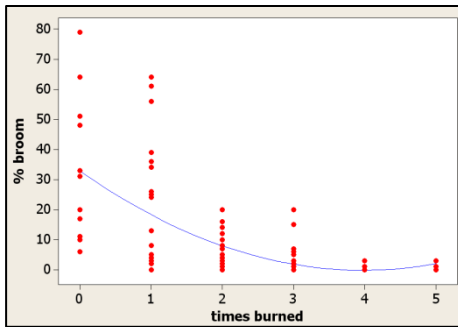
- Plots located at Tomales Point
 - Most recent burn 1993; most recent visit 2003
 - Last analyzed through Stephens lab contract in 2005
 - **Conclusions: repeated burning may decrease native cover and increase holcus cover**



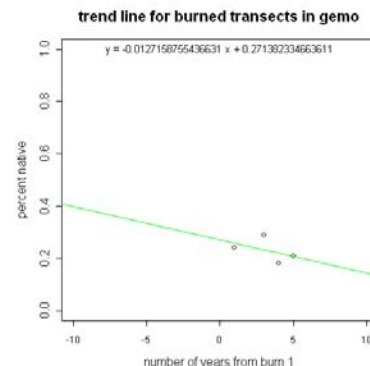
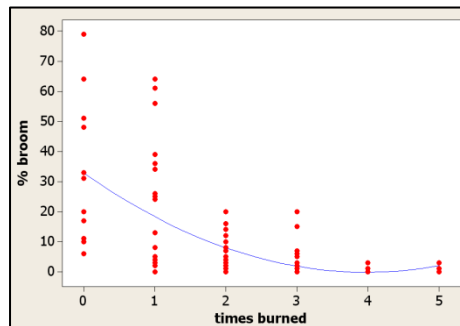
- o CYSC – Scotch broom

- Plots located on N Ranch
 - Most recent burn 2010; plots continue to be actively read
 - Last analyzed in 2011 (CYSC cover data only)
 - **Conclusions: repeated burning is effective in reducing broom cover, but also leads to decreases in native cover.**
 - Broom analysis is also summarized in: U:\Natural_Fire\Fire Ecologist\PORE Projects\Broom\Broom treatment summary.doc
 - Additional plots were added in 2010 to monitor Ellen's project; RM is doing analysis for those plots

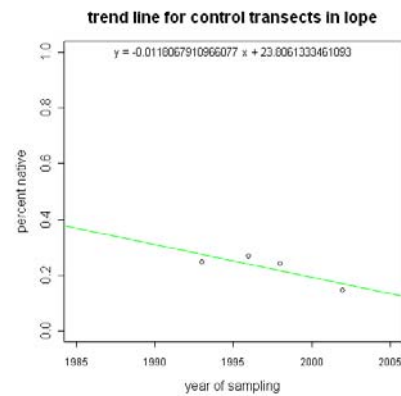
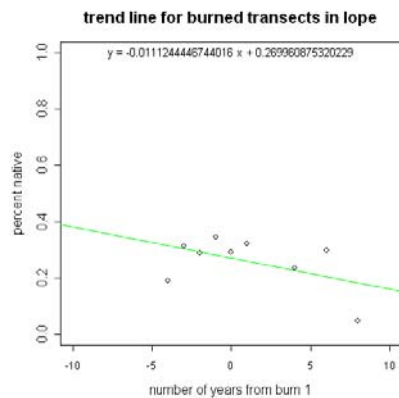
- Future work: reanalyze these data, especially native cover using recent info



- o DECE – Deschampsia prairie
 - Plots located along Limantour Road
 - Most recent burn 2008, most recent visit 2010
 - Last analyzed in 2011
 - Conclusions: substantial decrease in native cover post burn, but some recovery will likely occur as native perennial grasses recover from the fire.**
- o GEMO – French broom
 - Plots located in the Olema Valley
 - Most recent burn 2011; plots continue to be actively read
 - Last analyzed in 2011
 - Conclusions: repeated burning is effective in reducing broom cover, but also leads to decreases in native cover.**
 - Broom analysis is also summarized in: U:\Natural\Fire\Fire Ecologist\PORE Projects\Broom\Broom treatment summary.doc
 - Future work: reanalyze these data, especially native cover using recent info



- o LOPE – Non-native annual grassland
 - Plots located at Tomales Point & D Ranch
 - Most recent burn 2005; most recent visit 2010
 - Last analyzed in 2011 (D Ranch data only); through Stephens lab contract in 2005 (all other LOPE data)
 - Conclusions: percent native cover appears to be decreasing in both burn and control plots.**

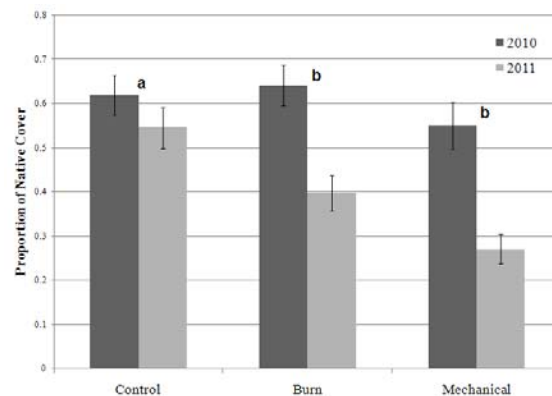
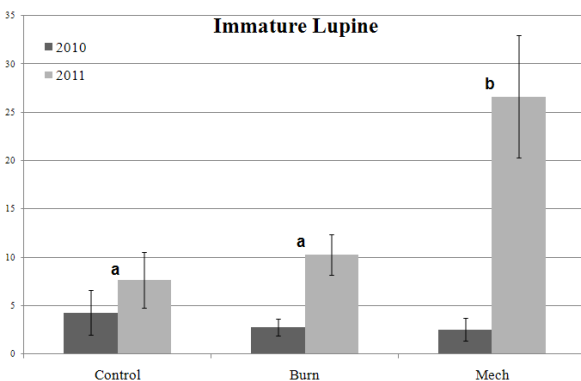


- o PHAQ – Non-native perennial grassland (Harding grass)
 - Plots located along Limantour Road
 - Most recent burn 2005; most recent visit 2010
 - Last analyzed in 2011
 - **Conclusions: percent native cover decreased slightly with burning; no benefits for PHAQ control.**

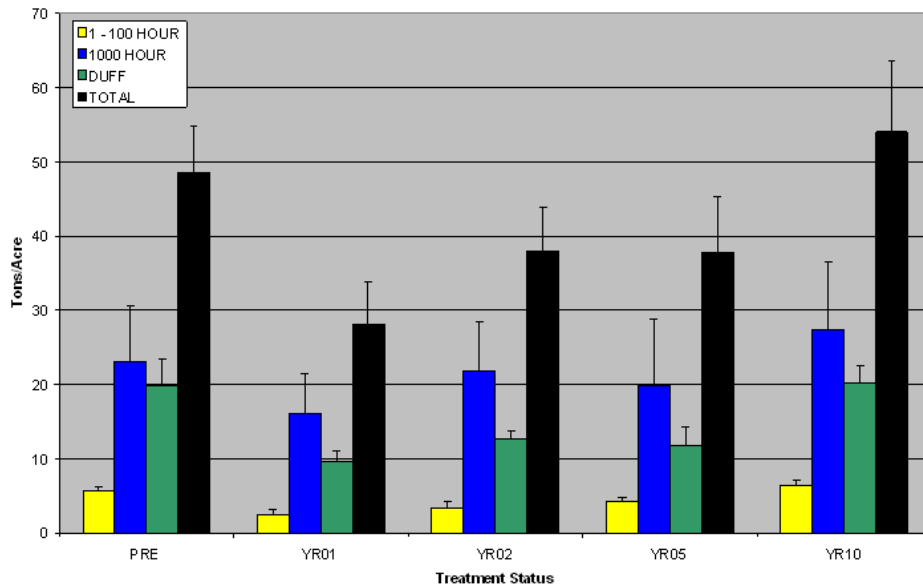
- GOGA

Overall comments: Many GOGA monitoring types have never been burned. Of those that have been burned, results from redwood and mission blue butterfly plots are described here. Several other vegetation types were analyzed in 2005 through a contract with UC Berkeley (U:\Natural\Fire\Fire Ecologist\Contracts\UCB - Fire Effects Data Analysis)

- o MBB – Mission blue butterfly
 - Plots located in Marin headlands and at Milagra
 - Burned in 2010; plots continue to be actively read
 - Last analyzed in 2012
 - **Conclusions: mechanical treatment is most effective at stimulating lupine regeneration. Both mechanical and burn treatments lead to decreased native cover, although we expect native cover to recover over time as perennial grasses regrow.**



- o SESE – Coast redwood
 - Plots located in Muir Woods
 - Burned in 1998; last read 2008



- Last analyzed in 2008
- **Conclusions: fuels loads decrease in year 1 post-fire, but returned to pre-fire levels by year 2. Results may be confounded by SOD mortality.**

- PINN

Overall comments: Prescribed fire is not recommended in chaparral at PINN for ecological reasons. Recent burning has focused on controlling yellow starthistle and those analysis are shown here.

- o CESO/YST – Yellow starthistle
 - Plots located in entrance meadow and bottomlands
 - Burned in 2010; plots continue to be actively read
 - Last analyzed in 2011
 - **Conclusions: YST cover decreased only slightly in the first year following fire. However, burning was followed by herbicide treatment, so data needs to be reanalyzed.**
 - **Future work: data needs to be reanalyzed to capture effects of herbicide treatment in year following burn**

APPENDIX 2

DRAFT 2012 Highway One *Genista monspessulana* (French broom) Monitoring Results

Prepared by:

Kristen Shive

Acting Fire Ecologist

Bay Area Network Fire Management Program

SUMMARY:

Management Goals:

- Maintain or increase cover of native species
 - Not met. Native species cover has decreased under repeated burn events.
- Maintain or decrease cover of French broom
 - Met. French broom cover has decreased markedly.
- Reduce fuel loading
 - Met (in terms of overall shrubby fuels, however there is little information on targets for this goal).

Future Management Recommendations:

- Recommend a pilot program where units burn every 3 years rather than every 2 years, to assess if an additional “rest year” promotes stronger native species recovery.
 - At minimum, **these units should not be burned more than every two years** (some areas have burned two years in a row) **as originally specified**.
- If the fire management office feels that the units need to be burned every two years for fuels concerns, more explicit guidelines for acceptable fuel loadings need to be articulated, so that those specific variables can be monitored. This would better enable deciding how to strike the balance between resource issues and fuel load issues.

RESULTS/DISCUSSION:

Native Species Cover

The goal to maintain or increase native cover is not being met. We detected a significant decrease in native cover for those plots where we have enough data to analyze. Changes to the burn unit boundaries over time have divided sample plots into several small groups of plots

that have actually been burned on the same schedule. Two of these groups were analyzed for this report.

First, there are five plots have burned six times, for which we have 6 years of sampling data. These plots were read between Re03YR03 (the third year after the 3rd burn) and Re06YR02 (the second year after the 6th burn), between 2005 to 2012. A repeated measures ANOVA test detected significant differences between years ($p = 0.016$). There significantly less native cover for all years as compared to the first year for which we are comparing data (Re03YR03) (Figure 1).

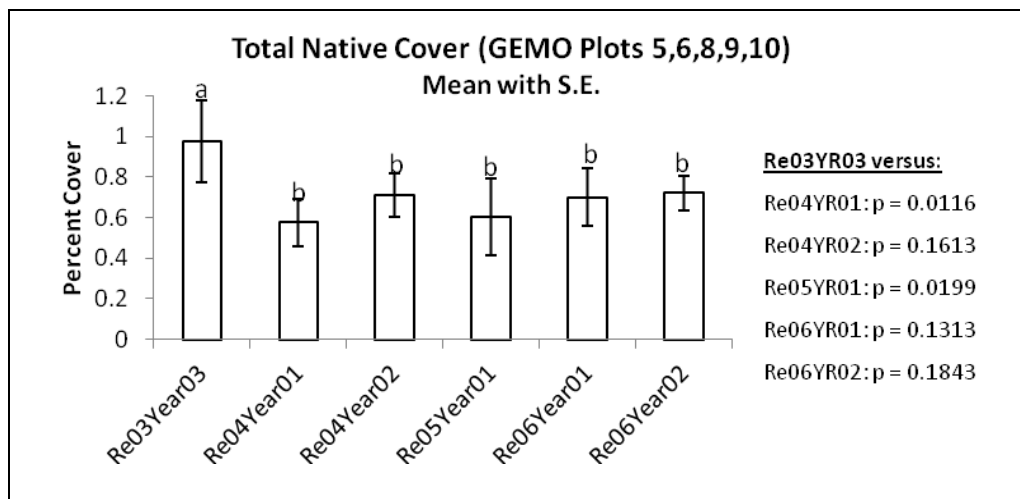


Figure 1. Cover is absolute cover (and so includes overlapping plants, and can be more than 100%), and was calculated from FMH point-intercept transect data. Reduction in native cover between Re03YR03 and Re06YR02 is approximately 26%.

Second, two plots burned on the same schedule and had pre-burn data. We were only able to compare the first and last year of data, Pre00 (pre-burn) and Re05YR02 (the second year after the 5th burn), from a statistical standpoint. A paired t-test found a highly significant reduction in native cover on these plots, approximately 19% ($p = 0.019$) (Figure 2).

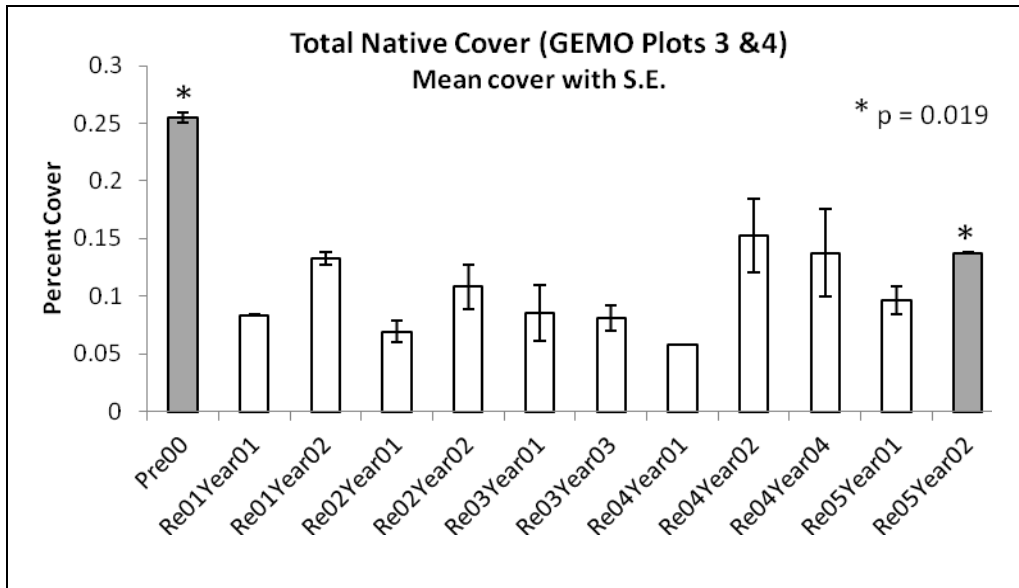


Figure 2. Cover is absolute cover (and so includes overlapping plants, and can be more than 100%), and was calculated from FMH point-intercept transect data. Where standard error bars are difficult to see, they are simply very very small (meaning that the two plots were very similar). P-value is from paired t-test, native cover reduction from pre-burn to Re05YR02 is about 19%.

Because all of the observed native cover on these plots is from perennial species, increases in native cover through time since burning are expected. Intervals of 1-2 years may be too short to allow for adequate recovery of these native species, and so may decrease their role in the ecosystem over time. From the native species viewpoint, a pilot study should be conducted which allows all areas to have 3 years of rest in order to see if the perennial native species are able to rebound. At minimum, all areas should have at least two years rest, as in the original recommendations.

French Broom Cover

The goals of reduction in French broom cover are being met. When examining the 5 plots for which we have data from Re03YR03 to Re06YR02, there were highly significant differences between years ($p = 0.000$). Cover of French broom was significantly lower for all years when compared with year Re03YR03. In 2012, two years after the most recent burn, French broom cover is approximately 4%, or 59% lower than in Re03YR03 (Figure 3).

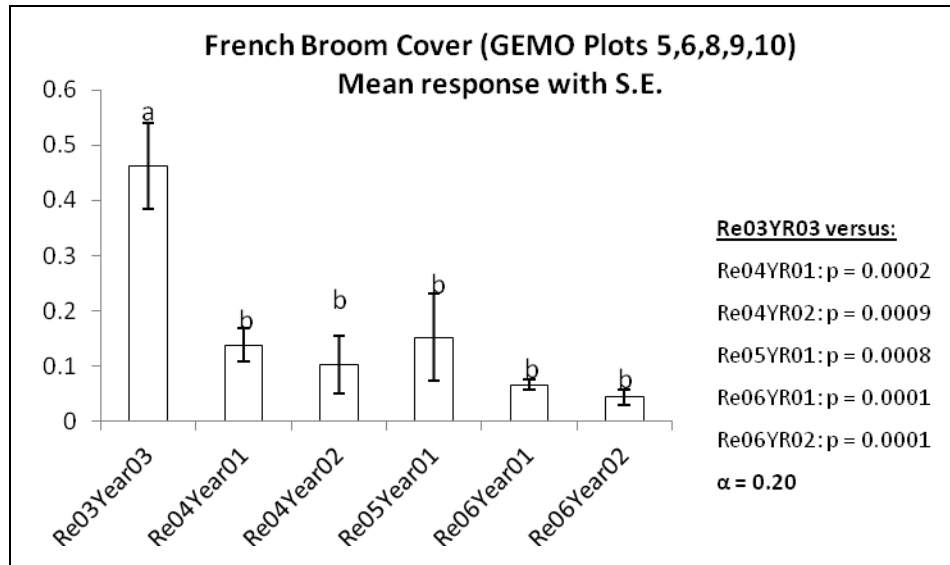


Figure 3. Cover is absolute cover (and so includes overlapping plants, and can be more than 100%), and was calculated from FMH point-intercept transect data. French broom cover reduction between Re03YR03 and Re06YR02 is approximately 42%.

Seedlings do respond robustly after each fire event, but it is unlikely waiting one more year (a third year) to burn will exacerbate this problem to be out of control. I was unable to analyze these data due to a shortened work schedule.

Although the first year of the above analyses, where broom cover is higher, represents the third year post-burn, I don't believe it necessarily means that waiting until year 3 will result in a surge of broom cover. This notion is supported by the overall reduction seen between the pre-read data and the Re05YR02 data from plots 3 and 4 (Figure 4). It may be that more frequent burns were needed initially knock back the broom, but that less frequent burns are required to maintain the lower levels of broom. If the three-year interval is tried as a pilot study, if it does not maintain the lower, desired levels of broom, it can be re-adjusted back to two years.

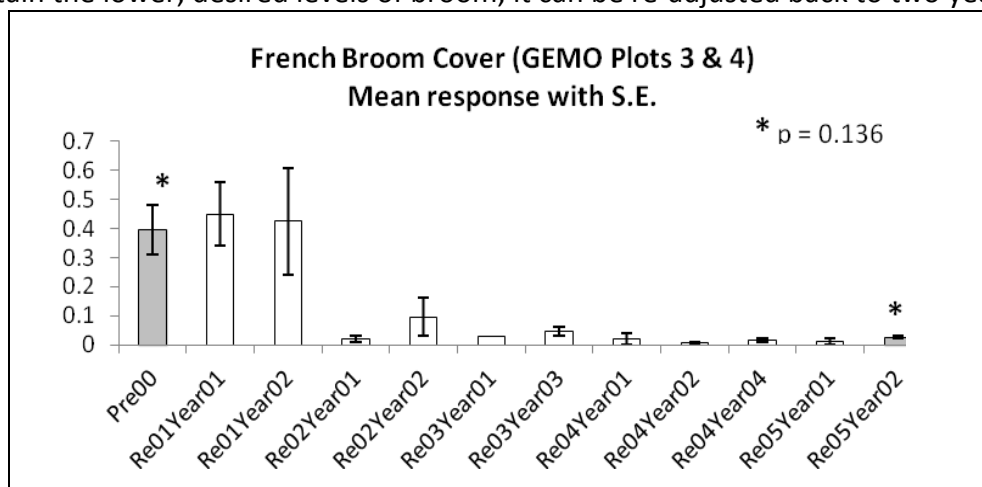


Figure 4. Cover is absolute cover (and so includes overlapping plants, and can be more than 100%), and was calculated from FMH point-intercept transect data. Where standard error bars are difficult to see, they are simply very very small (meaning that the two plots were very similar). French broom cover reduction between Pre00 and Re05YR02 is approximately 37%.

Fuels

Finally, from the fuels standpoint, overall shrub cover is much reduced relative to pre-burn levels (GEMO plots 3 & 4), and also relative to the Re03YR03 levels (GEMO plots 5,6,8,9,10). Also, because we targeted areas with 50% or greater infestations of broom, this likely overestimates the amount FRENCH BROOM, as well as brush.

To strike the balance between resource goals and fuels management, the fire management office should consider developing guidelines for desired fuel loads in these ecosystems, in order to help guide the timing of the burns. This would include measurable targets for shrub cover in these units (as shown below, the current overall shrub cover is around 30% in this part of the unit); if shrub height should also be factored in, that could be added to the monitoring protocols. In addition, the fire management office may consider limiting the more frequent burns to a tighter corridor along the highway.

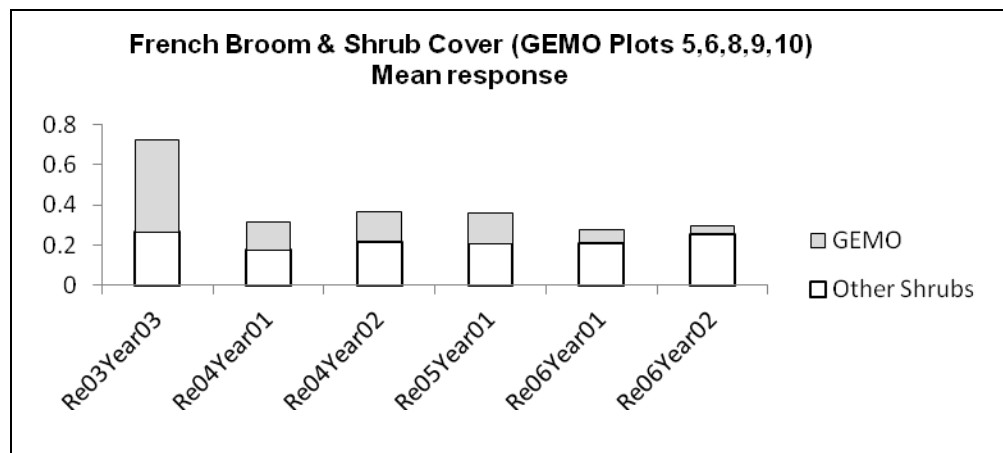


Figure 5. Cover is absolute cover (and so includes overlapping plants, and can be more than 100%), and was calculated from FMH point-intercept transect data. Shrub cover reduction between Re03YR03 and Re06YR02 is approximately 43%.

DATA ANALYSIS METHODS:

Five plots that burned on the same schedule from the RE03YR03 year (2005) to the Re06YR02 year (2012) were selected for analysis because they were the most robust dataset. For the analyses done on these plots (GEMO 5,6,8,9,10), a general linear model was used to perform a repeated measures ANOVA since the data met assumptions of normality on the residuals and equality of variance. Where the overall p-value for difference in means among years was significant ($\alpha = 0.20$), a Tukey test was subsequently used to analyze all pairwise comparisons.

There were only two plots with both pre and post-burn data that burned on the same schedule. These data lacked normality and violated equal variance assumptions, so the repeated measures ANOVA was not appropriate. In addition, because with only two plots power was likely to be low, rather than transform the data, a paired t-test on the first and last year of data was conducted (Pre and Re05YR02 – or two years after the 5th burn).