



National Park Service Klamath Network Parks Fire Ecology Annual Report Calendar Year 2015

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Coggins Park Subunit 5 - Two Year Post Rx Burn

A. Summary

The 2015 calendar year was similar to past years in the Klamath Fire Ecology program, in that collaboration and creativity were essential in accomplishing monitoring and research needs throughout the network. Efforts at REDW were again focused on advancing the understanding of fire effects in 2nd growth redwood forests. The Fire Ecologist assisted the REDW Forester and USGS crews to re-sample the Lower Airstrip Addition burn unit at 01YR02 and install plots in a shaded fuelbreak. Further, a fire history grant from Save the Redwoods League was received in collaboration with Humboldt State University, and work was initiated on the Little Bald Hills Reserve Fund research project in the Jeffrey Pine vegetation type. Monitoring efforts at WHIS were again focused on upper elevation mixed-conifer forest, with the re-measurement (02YR02) of six plots treated with Rx fire in 2013. Further sampling (01YR01) was completed in the Boulder Creek Mechanical Thin, a great project focused on oak woodland restoration. No monitoring was completed at ORCA in 2015, but the Fire Ecologist did assist with planning efforts for management of the newly created Preserve. Further monitoring of the Horseshoe Shaded Fuelbreak will occur in 2016 as the HSFB3 portion was completed in 2015.

The Klamath Fire Ecologist also maintained involvement in the larger fire ecology and management community by hosting Humboldt State University class fieldtrips at REDW and WHIS, presenting at the UC Cooperative Extension Oak Woodland Symposium, presenting at the Arcata March forestry lecture series, co-authoring a paper on flammability in Current Forestry Reports, and reviewing a manuscript for Forest Science.

The end of the 2015 calendar year marked year 3 for the Service First agreement with Redwood National Park and Six Rivers National Forest fire management. The Fire Ecologist assisted with WFDSS refreshers, fuel moisture program management, fire effects monitoring, and, after August 1st, assisted with wildfires for the duration of the summer.

Table 1. Fire Effects Plot Workload (2015) and Total Plots Installed

Park	Monitoring Unit	Type of Plot	Pre-burn 2015	Immed. Post 2015	Postburn (1-20 yrs) 2015	Annual total (2015)	Total Plots
Redwood National Park	Mixed Prairie (GMIPR1D03)	FMH Grass plot	0	0	0	0	38
Redwood National Park	Oregon Oak Woodland (FQUGA1D09)	FMH Forest plot	0	0	0	0	26
Redwood National Park	Old Growth Redwood (FSESE1D08)	FMH Forest plot	0	0	0	0	4
Redwood National Park	Jeffrey Pine (Little Bald Hills)	RA-Reserve Funded Savanna Restor.	14	0	0	14	14
Redwood National Park	Second Growth Forest	RA- Second Growth burn circular plots	0	0	9	9	19
Redwood National Park	Second Growth Forest	1-Ha Large Plot Sampling	0	0	2	2	2
Redwood National Park	Bald Hills Shaded Fuelbreak	RA- Forest Inventory Plots	40	0	0	40	40
Redwood National Park	Shaded-Fuelbreak	Photo-Points	0	0	0	0	12
Whiskeytown National Recreation Area	Whiteleaf Manzanita (BARVIG04)	FMH Brush Plot	0	0	0	0	10
Whiskeytown National Recreation Area	Whiteleaf Manzanita (FARVI1D04)	FMH Forest Plot	0	0	0	0	4
Whiskeytown National Recreation Area	Oak Woodland (FQUKE1D09)	FMH Forest Plot	0	0	0	0	11
Whiskeytown National Recreation Area	Oak Woodland (FQUCH1D09)	FMH Forest Plot	0	0	0	0	2
Whiskeytown National Recreation Area	Ponderosa Pine Forest (FPIPO1D09)	FMH Forest Plot	0	0	0	0	6
Whiskeytown National Recreation Area	Mixed Conifer Forest (FMICO1D08)	FMH Forest Plot (post-thin)	0	0	6	6	18
Whiskeytown National Recreation Area	Knobcone Pine Woodland (FPIAT1D10)	FMH Forest Plot	0	0	0	0	5
Whiskeytown National Recreation Area	East Boundary Mixed oak & conifer	Photo-Point	0	0	15	15	20
Whiskeytown	Encroached Black	Boulder	0	0	10	10	10

Park	Monitoring Unit	Type of Plot	Pre-burn 2015	Immed. Post 2015	Postburn (1-20 yrs) 2015	Annual total (2015)	Total Plots
National Recreation Area	Oak Woodland	Mechanical RA					
Oregon Caves National Monument	Douglas-fir Forest (FPSME1D10)	FMH Forest Plot	0	0	0	0	8
Oregon Caves National Monument	CC-9 Thinning	RA	0	0	0	0	4
Oregon Caves National Monument	Horseshoe Shaded Fuel Break	Rapid Assessment	0	0	0	0	7
Total			54	0	42	96	260

* Pilot sampling plots

Complete the staffing and personnel development table for fire ecologist and monitors (Table 2). Include fire training (e.g. S-290, RX-310), NPS training, distance learning or on-campus college credit, technology training, NWCG task books initiated or completed, conferences attended, etc.

Table 2. Fire Ecology Staffing 2015

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ Qualified (Yes or No)	Training and Development
Fire Ecologist	1/1/15	12/31/15	26	Yes	Fire Refresher; CPR/First Aid; S230; Single Resource Boss initiated; Norcal Rx Fire Council Meeting; UCCE Oak Woodland Symposium (presenter); NEPA training at SRNF; Retirement seminar; Presenter at Klamath I&M Conversation Day
HSU Student Tech*	5/26/15	7/3/15	2.5	n/a	
HSU Student Tech*	5/26/15	7/3/15	2.5	n/a	
Forestry Tech	5/26/15	6/26/15	2.5	No	
Forestry Tech	5/26/15	7/11/15	3.5	No	
WHIS Techs (3)***	6/1/15	6/12/15	1.5 for each	n/a	
HSU Intern**	1/15/2015	5/15/15	90 hours	n/a	n/a
HSU Intern**	1/15/2015	5/15/15	90 hours	n/a	n/a

*HSU Student Techs hired on Little Bald Hills Reserve Fund project

**REDW hosted an internship program with Humboldt State University during the spring semester, 2015. The Fire Ecologist utilized two interns for 90 hours each, and both assisted with fire effects plot work at REDW.

***WHIS techs included three seasonal Weeds techs from J. Gibson's crew at Whiskeytown.

Table 3. 2015 Management Objectives and Monitoring Results

The Fire Effects Monitoring program at Redwood contains six monitoring types: Oak Woodland, Mixed Prairie, Old-Growth (inactive), Little Bald Hills, Fir Plots (short-term monitoring), and Second growth (RA). Post-fire results are available for Mixed Prairie and Oak Woodland (see previous annual reports for Fir plots). An analysis of second growth redwood prescribed fires is included below, outside of table 3. Previously analyzed objectives have been included. All results shown in Table 3 include 80% confidence intervals of the mean. Minimum sample size has been attained for only the Oak Woodland (FQUGA1D09) monitoring type at 01YR02 (partly due to the relatively small desired *minimum detectable change* of 10% relative native cover).

Monitoring Unit	Management Objective	Monitoring Results (80% confidence interval)	Objective Achieved?	Year Last Analysis Completed
Mixed Prairie (GMIPR1D03)	1 st Burn: Do not reduce native plant relative cover by >10% from preburn levels within two years of the burn.	Change in native plant relative cover = +8.6% PRE: 24.2 (21.0—27.3) % cover 01YR02: 26.3 (23.2—29.4) % cover (n= 27 plots, 12 burn units)	Yes	2010 (1991-1999)
	2 nd Burn: Do not reduce native plant relative cover by >10% from preburn levels within two years of the burn.	Change in native plant relative cover = -1.3% PRE: 26.7 (22.7—30.7) % cover 02YR02: 26.4 (20.9—31.8) % cover (n= 16 plots, 10 burn units)	Yes	2010 (1990-2007)
	3 rd Burn: Do not reduce native plant relative cover by >10% from preburn levels within two years of the burn.	Change in native plant relative cover = +18.3% PRE: 27.5 (22.7—32.3) % cover 03YR02: 32.5 (27.7—37.4) % cover (n= 13 plots, 6 burn units)	Yes	2010 (1990-2000)
	4 th Burn: Do not reduce native plant relative cover by >10% from preburn levels within two years of the burn.	Change in native plant relative cover = -10.1% PRE: 34.4 (27.2—41.7) % cover 04YR02: 31.0 (27.0—34.9) % cover (n= 6 plots, 5 burn units)	No	2010 (1990-2010)
	5 th Burn: Do not reduce native plant relative cover by >10% from preburn levels within two years of the burn.	Change in native plant relative cover = -6.9% PRE: 26.4 (21.0—31.8) % cover 05YR02: 24.6 (19.9—29.2) % cover (n= 7 plots, 4 burn units)	Yes	2010 (1991-2010)
	6 th Burn: Do not reduce native plant relative cover by >10% from preburn levels within two years of the burn.	Change in native plant relative cover = -12.2% PRE: 29.3 (23.9—34.7) % cover 06YR02: 25.8 (23.7—27.8) % cover (n= 7 plots, 4 burn units)	No (but close)	2012 (1991-2012)
Oregon Oak Woodland (FQUGA1D09)	1 st Burn: Do not reduce native plant relative cover by >10% from preburn levels within two years of the burn.	Change in native plant relative cover = -7.8% PRE: 49.8 (45.3—54.2) % cover 01YR02: 45.9 (40.8—51.0) % cover (n= 22 plots, 8 burn units)	Yes	2010 (1991-1999)
	2 nd Burn: Do not reduce native plant relative cover by	Change in native plant relative cover = -7.1%	Yes	2010 (1992-

Monitoring Unit	Management Objective	Monitoring Results (80% confidence interval)	Objective Achieved?	Year Last Analysis Completed
	>10% from preburn levels within two years of the burn.	PRE: 48.2 (40.0—56.3) % cover 02YR02: 44.8 (38.8—50.7) % cover (n = 9 plots, 5 burn units)		2004)
	3 rd Burn: Do not reduce native plant relative cover by >10% from preburn levels within two years of the burn.	Change in native plant relative cover = -13.2% PRE: 52.5 (45.8—59.2) % cover 03YR02: 45.6 (40.5—50.6) % cover (n = 13 plots, 5 burn units)	No	2010 (1991-2010)
	4 th Burn: Do not reduce native plant relative cover by >10% from preburn levels within two years of the burn.	Change in native plant relative cover = -23.4% PRE: 49.6 (40.0—59.1) % cover 04YR02: 38.0 (33.8—42.2) % cover (n = 4 plots, 2 burn units)	No	2010 (1991-2004)
	5 th Burn: Do not reduce native plant relative cover by >10% from preburn levels within two years of the burn.	Change in native plant relative cover = -23.7% PRE: 42.7 (33.6—51.8) % cover 05YR02: 32.6 (27.2—38.0) % cover (n = 6 plots, 3 burn units)	No	2012 (1992-2012)
	6 th Burn: Do not reduce native plant relative cover by >10% from preburn levels within two years of the burn.	Change in native plant relative cover = -30.9% PRE: 47.4 (40.2—54.6) 06YR02: 32.7 (26.2—39.3) (n = 6 plots, 1 burn unit) 06YR05: -32.9 (26.8-38.9) (n = 6 plots, 1 burn unit)	No	2010 (1991-2010) 2013 (YR05)

Redwood – Second Growth Forest 2015

The following report was prepared for the REDW Resource Management and Science Newsletter, with assistance from REDW Forester Jason Teraoka and USGS Research Scientist Phil van Mantgem:

Report on Fire Effects in Second Growth Redwood: Using Prescribed Fire as a Forest Restoration Tool at Redwood National Park

Eamon Engber, Jason Teraoka, Phil van Mantgem

INTRO

Redwood National and State Parks (RNSP) are best known as having the most spectacular examples of old-growth coastal redwood forests, but approximately 45% of RNSP is composed of second-growth forests. Typical structure of young redwood stands impedes the rapid recovery of old-growth conditions, such as dominance of redwood (*Sequoia sempervirens*), distinct canopy layers and diverse understory vegetation (O'Hara et al. 2010, Teraoka and Keyes 2011). Young forests are commonly comprised of dense, even-aged Douglas-fir (*Pseudotsuga menziesii*) and redwood stump sprouts, with simple canopy structure and little understory development. Under these conditions the relatively shade-intolerant Douglas-fir is expected to exclude redwood from the upper canopy until large gaps are formed, a process that may take

centuries (Thornburgh et al. 2000). Moreover, many of these young second growth stands are believed to be vulnerable to disturbance in the form of drought, disease and fire (Figure 1). While the presence of second-growth redwood forest presents a management challenge, it also provides an opportunity for landscape restoration, particularly important to RNSP as it is a mandate of the 1978 Redwood National Park Expansion Act.

In this article we present and discuss results from three prescribed fires that were conducted to help restore second-growth forests in RNSP, dating back to 2006. The three case studies demonstrate both low-intensity and moderate-intensity treatments, and we discuss management implications and long term monitoring.

The objectives of forest restoration are to: decrease stand density; increase spatial heterogeneity in the forest canopy; alter tree species composition to give redwood a competitive advantage; increase understory diversity; and increase forest vigor to make the forests less susceptible to environmental stressors.

RNSP uses silviculture (i.e., mechanical thinning) as the primary tool to meet the forest restoration objectives. These methods have a long history of success in commercial and non-commercial settings (Bauhus et al. 2009, Teraoka and Keyes 2011). The use of silviculture in ecological restoration is generally a novel approach to park management and was first used by Stephen Veirs in the early 1980's. However, prescribed fire may have utility in low-accessibility stands, and may have novel effects (e.g., fuels reduction, understory vegetation response, snag and cavity creation, nutrient cycling etc.). To explore these possibilities, the 2006 Dolason Trail Head, the 2007 Dolason-Airstip (DA), and 2013 Lower Airstrip Expansion (LAE) prescribed fire projects were conducted to demonstrate the use of prescribed fire as a forest restoration tool.

With its thick bark, tall canopy, and ability to re-sprout, redwood is an incredibly resilient tree that can persist through multiple episodes of fire or flooding (Lorimer et al. 2009). Tree ring evidence suggests fires were historically quite frequent in redwood forests, due to a combination of Native American and lightning ignition sources. Fire history research in Del Norte and northern Humboldt counties has reported historical fire return intervals of about 10 years at a site east of Prairie Creek State Park (Brown and Swetnam 1994) to 11 - 26 years in Del Norte Redwoods State Park (Norman 2007), and up to 500 years at humid coastal sites in Redwood National and State Parks (Veirs 1980). While fire surely played a role in the development of many old growth stands, second growth redwood forest structure differs drastically from old growth (e.g., smaller trees, more of them, sprouts surrounding rotten stumps), and limited information is available on the effects of fire in second growth redwood stands.



Figure 1. Typical second-growth conditions in RNP, depicting high density and dominance of Douglas-fir.

Case Studies of Prescribed Fire in Second Growth Forests

We present monitoring results from three prescribed fire projects located in the Bald Hills area: Dolason-Airstrip 2007 (12.1 ha, 30 ac), a low-moderate intensity burn; Dolason Trailhead 2006 (3.2 ha, 8 ac), a moderate-high intensity burn, and Lower Airstrip Expansion 2013 (20.2 ha, 50 ac), a low intensity burn. All stands within these units were 40-45 years of age at time of treatment. Table 1 displays the primary forest attributes monitored for these projects, including stand density (trees per hectare [TPHa] and basal area [m^2ha^{-1} , BAHa]), overstory species composition, and fuel loading (fine fuels [1-100Hr], < than 3 inches diameter; heavy fuels [1000Hr], > than 3 inches diameter).

Table 1. Results for forest attributes measured for each case study. PRE = prior to fire treatment. YR-1 and Yr-7 = 1 and 7 years post-treatment, respectively. Species composition is in percent.

Attribute	LAE PRE	LAE YR-1	DA PRE	DA YR-7	DTH - Post	DTH YR-7
TPHa*	1533	1206	1638	948	469	143
BAHa**	86.8	83.5	76.4	76.3	120.4	91.5
Fine Fuel TPA	5.3	3.6	4.8	5.9	1.0	7.0
Heavy Fuel TPA	11.9	17.7	35.5	28.0	16.7	22.7
Species Composition (%)						
Redwood TPHA	13.7	14.1	17.4	23.5	-	-
Redwood BAHa	39.0	39.6	19.5	20.4	-	-
Douglas-fir TPHa	30.9	34.2	29.2	31.5	75.3	91.3
Douglas-fir BAHa	36.5	36.6	49.2	51.2	99.5	99.99
Tanoak TPHA	45.0	40.9	51.2	44.2	24.7	8.7
Tanoak BAHa	21.0	20.2	30.8	28.0	0.5	0.001

* TPHA = Trees per hectare

**BAHa = Basal Area, square meters per hectare

Case Study #1: Dolason-Airstrip Burn Unit 2007 - Low/Moderate Intensity Prescribed Fire

The Dolason-Airstrip Burn Unit is a mix of second-growth forest and conifer-encroached prairie. Dominant tree canopy cover is Douglas-fir followed by tanoak (*Notholithocarpus densiflorus*) and then redwood. There had been no prior management to the unit by the Park, until the 2007 prescribed burn; monitoring plots were re-measured 1 year post-burn and again in 2014.

Fine fuel loading was reduced by about 40% immediately following the burn, however by seven years post burn, fine fuels recruited 23% above pre-burn condition (Figure 3.) Heavy fuels remain 21% below the pre-burn condition after seven years.

Prior to treatment, there was an average of 1,638 trees per hectare and 76.4 square meters of basal area per hectare. Seven years after treatment, there was an average of 948 trees per hectare (42% decrease), and 76.3 square meters of basal area per hectare (no substantial change). Tree

mortality was concentrated in the smaller size classes (below 30 cm DBH; Figure 4). Prior to the prescribed burn, there were 68% more Douglas-fir trees than redwood trees, and 152% more Douglas-fir basal area than redwood basal area. Seven years following the burn entry, there are 34% more Douglas-fir trees than redwood; basal area remains unchanged (from 152% to 151%) (see Table 1 and Figure 4.).



Figure 2. Fire spread in the Dolason-Airstrip Rx burn, 2007.

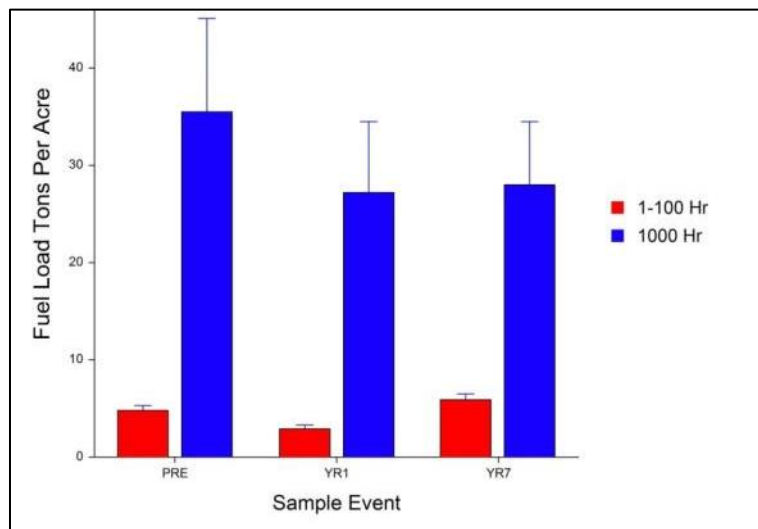


Figure 3. Fine fuel loading (1-100 Hr; Red) and heavy fuel loading (1000 Hr; Blue) at pre-burn, 1-yr post-burn, and 7 years post-burn. Dolason-Airstrip Prescribed burn.

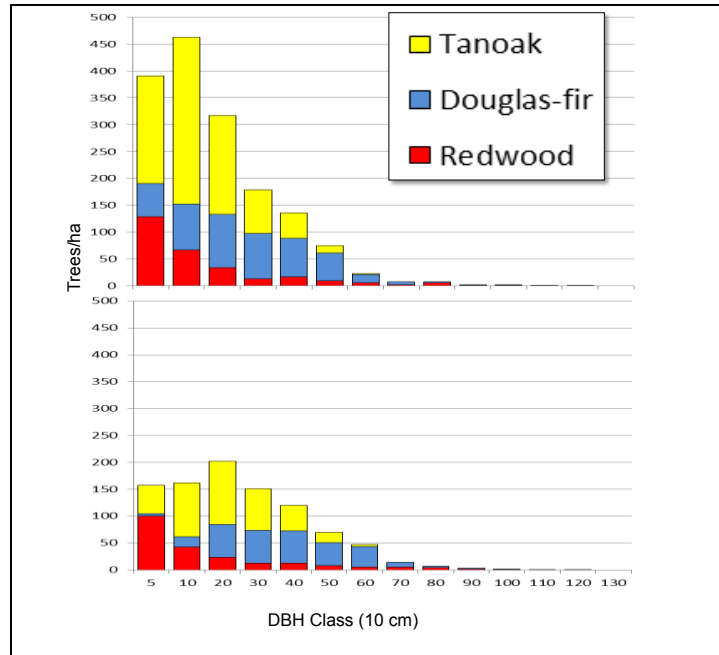


Figure 4. Diameter distribution pre-burn (Top) and 7 years post-burn (Bottom). Bars represent the number of trees per hectare (by species) in each 10 centimeter diameter size class.



Figure 5. Photo-point depicting tree canopy (Top) and understory condition (Bottom) pre-burn (Left), immediate post-burn (Center), and 7 years post-burn (Right).

Case Study #2: Dolason Trailhead 2006 - Moderate/High Intensity Prescribed Fire

The Dolason Trailhead burn unit demonstrates the use of moderate-high intensity prescribed fire in encroached prairie (Figure 6). Due to circumstances, monitoring plots were installed immediately post-burn, so no true pre-burn data are available. However, at the immediate post-burn sample, the pre-burn stand condition (e.g., living/dead status of trees) was assumed, based on presence/absence of scorched foliage. No pre-burn fuels data are presented. Dominant tree canopy cover is Douglas-fir, followed by a minor understory tanoak component. There had been no prior management of the unit by the Park until the 2006 prescribed fire; monitoring plots were re-measured in 2013.

Fine fuel loading increased by 600% between the **immediate post-burn** sample and the seven year post-burn sample (Table 1; Figure 7). Heavy fuel loading increased by 36% between the immediate post-burn sample and the seven year post-burn sample.

Prior to treatment, we assume there were an average of 469 live trees per hectare and 120.4 square meters of basal area per hectare (assumption based on estimated live/dead tree status at the immediate post-burn sample event; Table 1). Immediately post treatment, there were 206 trees per hectare and 103.5 square meters of basal area per hectare. Seven years after treatment, there was an average of 143 trees per hectare (69% decrease from pre-burn), and 91.5 square meters of basal area per hectare (24% decrease from pre-burn). Tree mortality was concentrated in the size classes below 60 cm DBH. Tanoak dominated the small size classes (< 30 cm DBH); all but one died immediately following the burn, the single survivor perished by year 7 (Figure 8). Most top-killed tanoak currently exhibit 1 meter tall basal sprouts (Figure 9).



Figure 6. Moderate to high intensity fire in the Dolason Trainhead Precribed Burn.

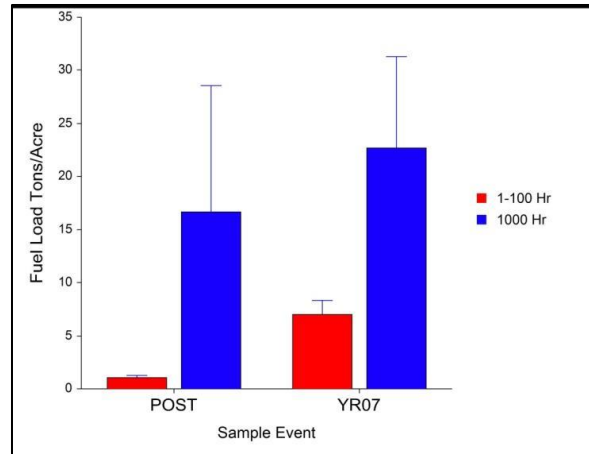


Figure 7. Fine fuel loading (1-100 Hr; Red) and heavy fuel loading (1000 Hr; Blue) immediately post-burn and at 7 years post-burn, Dolason Trailhead Prescribed burn.

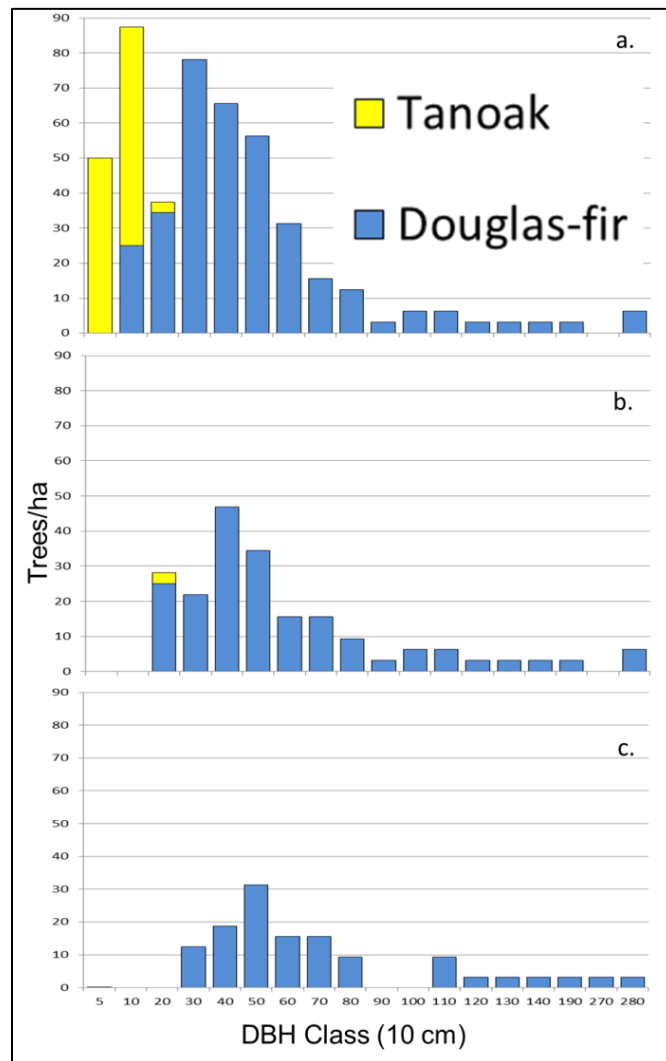


Figure 8. Diameter distribution pre-burn (a) immediately post-burn (b), and 7 years post-burn (c). Bars represent the number of trees per hectare (by species) in each 10 centimeter diameter size class.



Figure 9. Tanoak mortality and basal sprouting in the Dolason Trailhead Prescribed Burn.



Figure 10. Evident canopy mortality in a high-intensity patch of the Dolason Trainhead Prescribed Burn.



Figure 11. HSU student interns measuring a wolf tree in the Dolason Trailhead Burn Unit.

Case Study #3: Lower Airstrip Expansion 2013: Low Intensity Prescribed Fire

The Lower Airstrip Burn Unit is mostly second-growth forest dominated by Douglas-fir, with lesser amounts of tanoak, redwood, and other hardwoods. There had been minimal management to the unit by the Park until the 2013 prescribed burn; monitoring plots were re-measured 1 year post-burn.

Fire spread was intermittent throughout the Lower Airstrip Prescribed Burn due to moist fall conditions, and mostly low intensity, with flame lengths typically less than 0.3 meters (1 foot) (Figure 12), though there were small pockets ($\sim 1/20^{\text{th}}$ Ha) of high-severity fire where fuels, topography, and ignition patterns aligned. Many areas with green vegetation (ferns) or short-needle litter (Douglas-fir fuelbeds) carried fire poorly and resulted in a patchy burn pattern (Figure 13).



Figure 12. Low-intensity fire behavior in the Lower Airstrip burn.

Almost 1400 living and dead trees were sampled in the monitoring plots pre-burn. Overall tree mortality was low at one year post-burn, as expected given the low-intensity fire behavior observed during the burn. For overstory trees ≥ 20 cm DBH, the one year post-fire mortality rate for redwood was 1.4%, 2.1% for Douglas-fir, and 2.2% for other species (tanoak and bay); in other words, overstory composition didn't change much following the burn. Trees less than 20 cm DBH exhibited an overall mortality rate of 58% for redwood, 25% for Douglas-fir, 36% for tanoak, and 21% for bay laurel. Mortality of redwood was mostly concentrated in trees smaller than 10 cm DBH, many of which re-sprouted.



Figure 13. Heterogeneous burn pattern in the Lower Airstrip Expansion unit.

For overstory redwoods, 29% of the stems had new basal sprouts at 1 year post-burn, with a mean sprout height of 15 inches (Figure 14). Redwood poles had an even more vigorous sprouting response, with 73% re-sprouting from the base (mean sprout height of 14 in) and 27% from the bole (epicormic), usually outcompeting nearby tanoak and bay laurel. Generally, areas with higher fire intensity had a more vigorous sprouting response. Also, portions of the stand with more redwood litter (surface fuel) burned with greater fuel consumption and continuous fire spread due to the flammable redwood leaf litter.



Figure 14. Basal and epicormic sprouting on redwood in the Lower Airstrip Expansion Burn Unit.

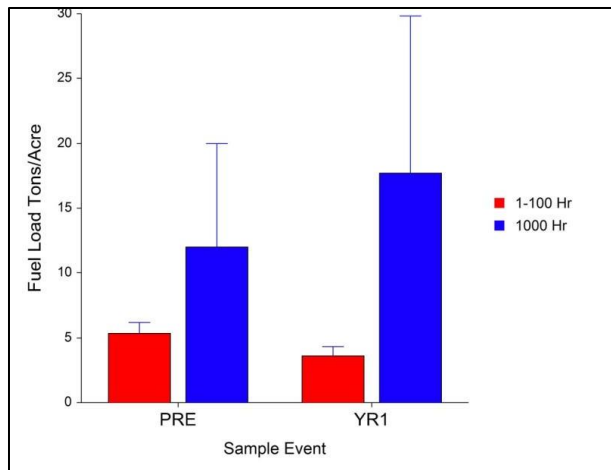


Figure 15. Fine fuel loading (1-100 Hr) and heavy fuel loading (1000 Hr) Pre-burn, and at 1 year post-burn. Lower Airstrip Prescribed Burn Unit.

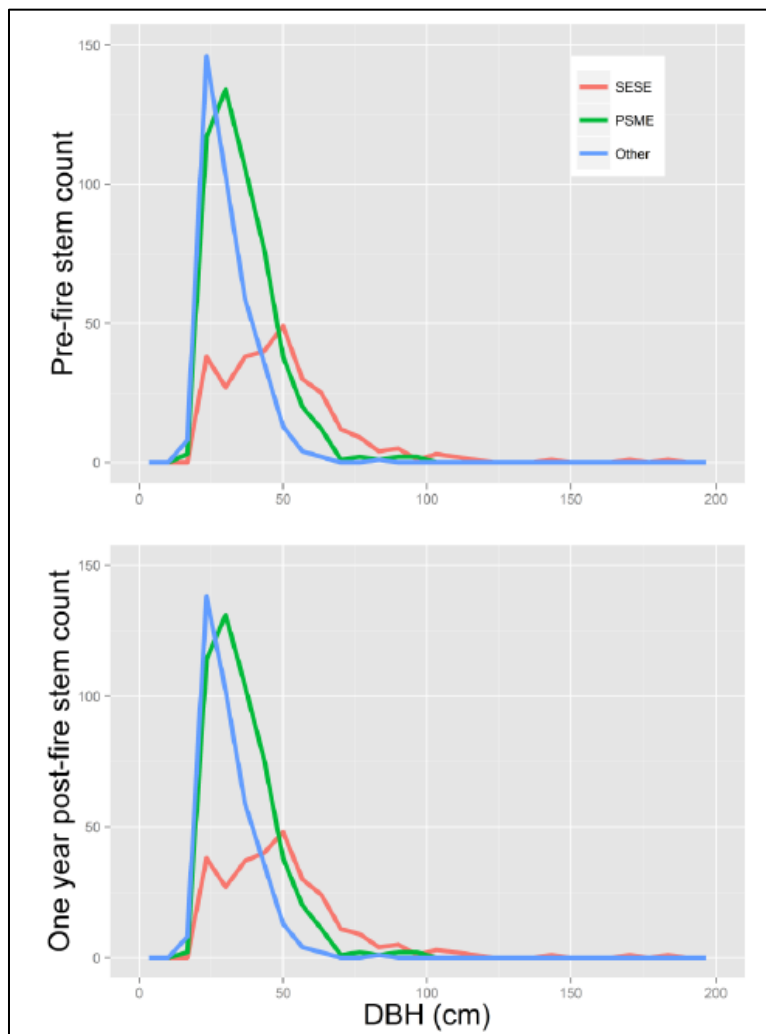


Figure 16. Overstory tree (> 20 cm DBH) diameter distribution pre-burn (Top) and 1 year post-burn (Bottom) at the Lower Airstrip Expansion Prescribed Burn, showing minimal change.

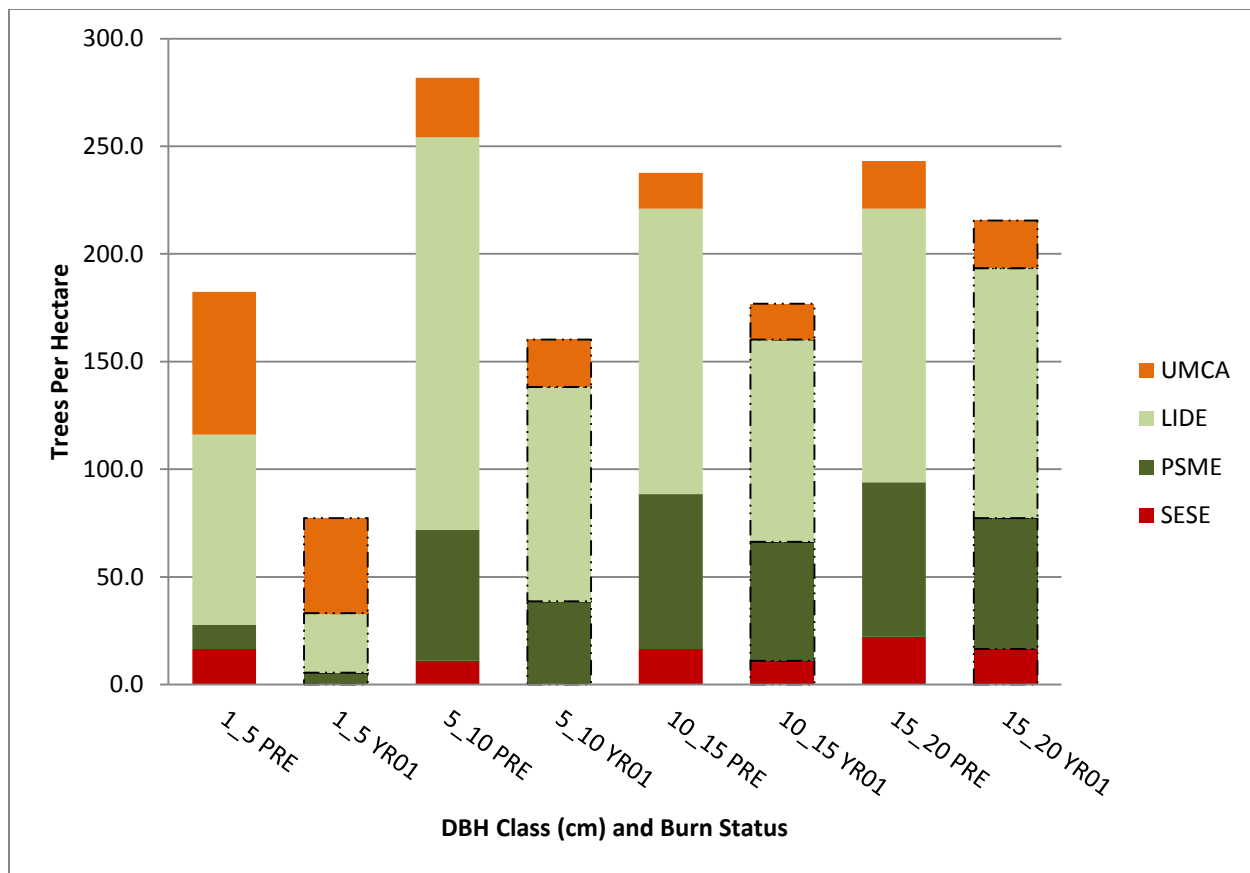


Figure 17. Small tree (<20 cm DBH) diameter distribution by 5 cm size classes and paired Pre-burn and YR-1 condition. Colors represent species, and most change occurred below the 10 cm DBH class.

Conclusions and Take-Homes:

- Forest Structure
 - The low-intensity prescribed fire resulted in small changes to overstory forest structure, but some mortality of smaller trees, concentrated below 20-30 cm DBH
 - Moderate to high intensity fire may increase mortality in Douglas-fir up to 60 cm DBH, and top-kill all understory tanoak (Dolason TH burn)
 - Redwood's main competition – Douglas-fir in the **larger** classes – may not be affected by low-moderate intensity fire and will need follow-up mechanical thinning
 - Diameter growth for living trees was observed during the 7-year study period
 - Burning initiates a vigorous sprouting response (basal and epicormic) on pole and overstory redwoods and tanoak, which will result in new cohorts of trees
- Fuels and Fire Behavior

- Redwood leaf litter is quite flammable and areas dominated by redwood were observed to burn at a higher intensity and with greater fuel consumption than areas dominated by Douglas-fir. While small redwoods may be susceptible to increased mortality, competitors are likely to suffer greater injury, and the ability of redwood to resprout may give the species an advantage.
- Further work is needed to analyze the effects of residual stumps and fire behavior in clonal redwood groups (e.g., does stump smoldering increase mortality in redwood?)
- Fine fuels fully recover, even exceed pre-burn load by 7 Yr post burn, suggesting re-entry may be necessary to maintain low fuel loading
- Heavy fuels may remain unchanged (low intensity burns) or increase or decrease (moderate-high intensity burns) by seven years post-burn
- Management Implications
 - Prescribed fire is an alternate second growth management tool, with some notable differences to standard silvicultural methods. The application of prescribed fire:
 - returns a key process to fire-adapted landscapes and may have unique effects
 - may promote redwood, but with less control over outcomes
 - may be difficult to achieve large Douglas-fir mortality goals while remaining in prescription, requiring mechanical thinning to remove large trees
 - The use of prescribed fire in second growth forests warrants further study to assess: patterns in tree mortality; the role of redwood stump smoldering and consumption in redwood mortality; and understory vegetation recovery following fire

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References

- Bauhus, J., K. Puettmann, and C. Messier. 2009. Silviculture for old-growth attributes. *Forest Ecology and Management* **258**:525-537.
- Brown, P. M., and T. W. Swetnam. 1994. A cross-dated fire history from coast redwood near Redwood National Park, California. *Canadian Journal of Forest Research* **24**:21-31.

- Lorimer, C. G., D. J. Porter, M. A. Madej, J. D. Stuart, S. D. Veirs Jr, S. P. Norman, K. L. O'Hara, and W. J. Libby. 2009. Presettlement and modern disturbance regimes in coast redwood forests: Implications for the conservation of old-growth stands. *Forest Ecology and Management* **258**:1038-1054.
- Norman, S. P. 2007. A 500-year record of fire from a humid coast redwood forest. Report to Save-the-Redwoods League.
- O'Hara, K. L., J. C. B. Nesmith, L. Leonard, and D. J. Porter. 2010. Restoration of old forest features in coast redwood forests using early-stage variable-density thinning. *Restoration Ecology* **18**:125-135.
- Teraoka, J. R., and C. R. Keyes. 2011. Low thinning as a forest restoration tool at Redwood National Park. *Western Journal of Applied Forestry* **26**:91-93.
- Thornburgh, D. A., R. F. Noss, D. P. Angelides, C. M. Olson, F. Euphrat, and H. Welsh. 2000. Managing redwoods. Pages 229-261 in R. F. Noss, editor. *The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods*. Island Press, Washington D.C.
- Veirs, S. 1980. The influence of fire in coast redwood forests. Pages 20-24 *Fire History Workshop Proceedings*. USDA Forest Service, General Technical Report RM-81.

Redwood – Little Bald Hills (LBH) Jeffrey Pine Savanna 2015

Season 1 of fieldwork for the LBH/Coon Mtn Reserve Fund project was completed in 2015. This project examines influences on understory vegetation in serpentine Jeffrey Pine savanna, including overstory structure (e.g., tree encroachment) and fuels/thinning work.

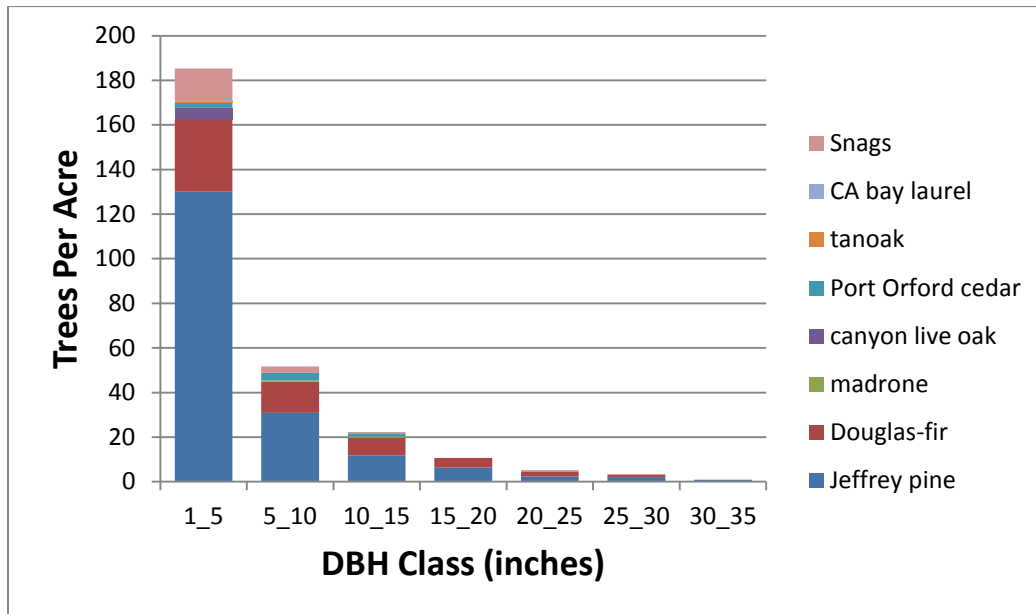
Season 1 was focused in the LBH study site, and the crew had sufficient time (6 weeks) to sample 6 existing veg plots (installed in early 1980s) and install 14 new plots. Plots were located in areas proposed for savanna restoration (thinning). Two students from HSU worked on the project primarily, with some assistance from two seasonal techs, the Fire Ecologist, and the REDW Vegetation Ecologist.

Preliminary summary charts for the 14 plots installed in the LBH are included below:

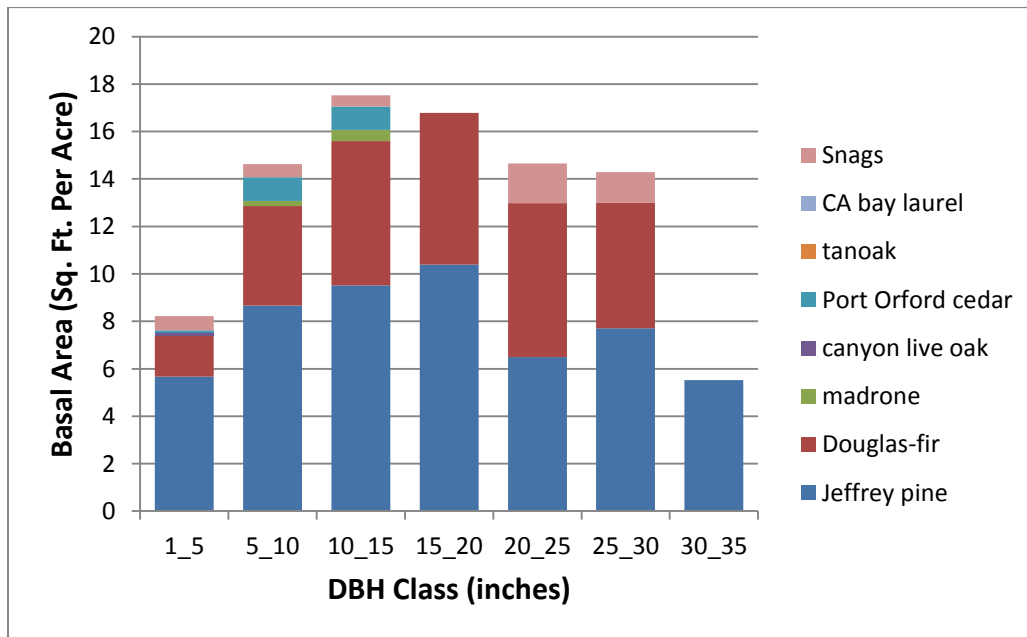


Little Bald Hills study site in Redwood National Park

Tree Density and Basal Area in the Little Bald Hills

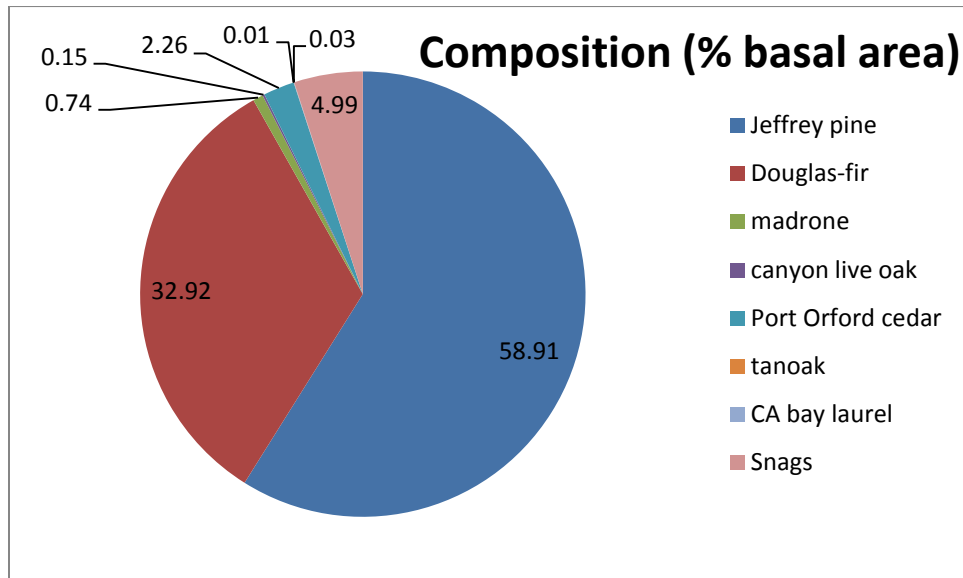


Tree Diameter distribution for Little Bald Hills vegetation plots (n=14)

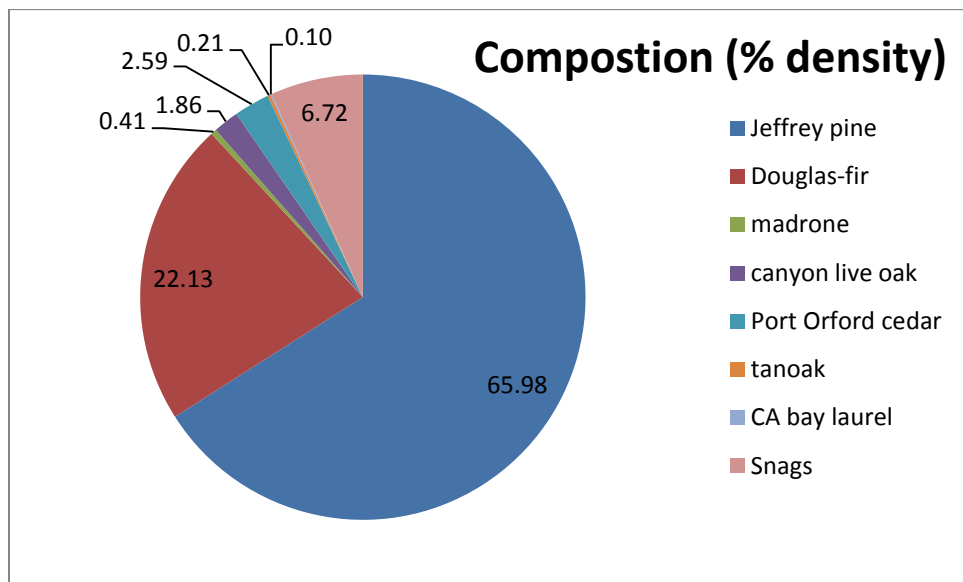


Basal Area by diameter class for Little Bald Hills vegetation plots (n=14)

Forest Composition by Density and Basal Area in the Little Bald Hills



Percent composition by Basal Area on Little Bald Hills vegetation plots (n=14)



Percent composition by Density on Little Bald Hills vegetation plots (n=14)

Understory Vegetation Cover and Frequency in the Little Bald Hills

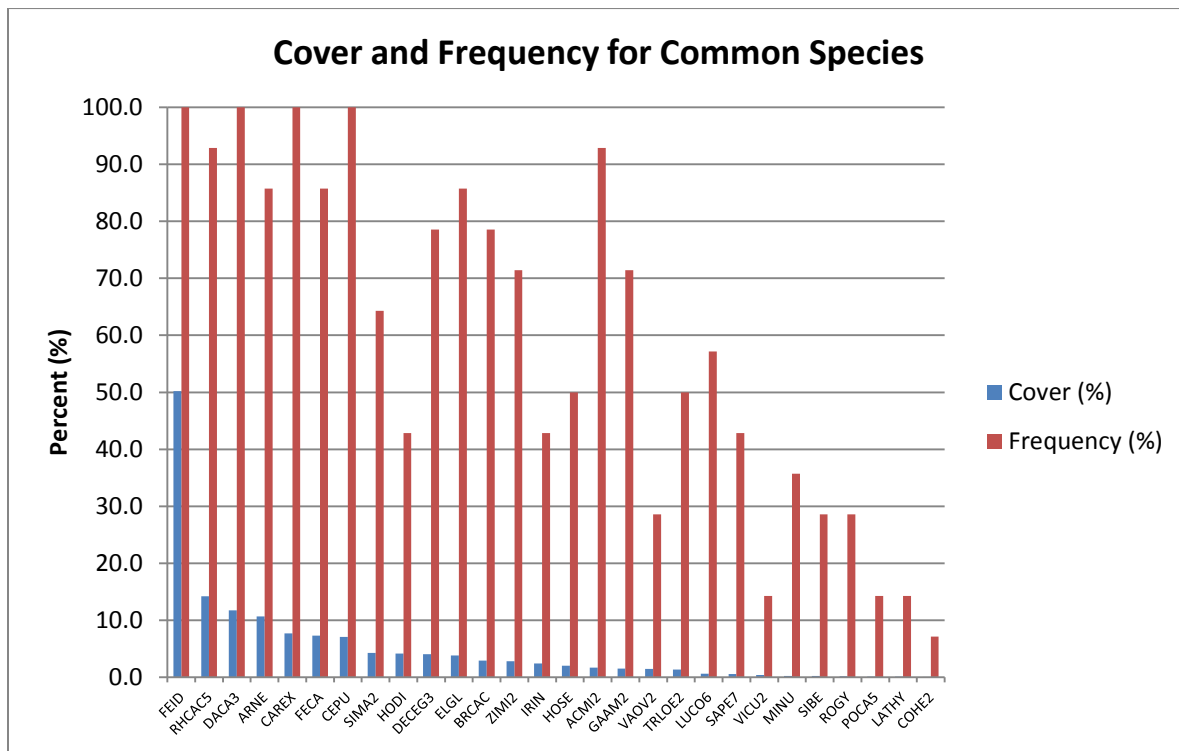


Figure 18. Understory vegetation cover (%) and frequency (%) on Little Bald Hills vegetation plots (n=14). See Table 1 below for species codes.

Table 1. Common understory species cover (%) and frequency (% of plots encountered) on Little Bald Hills vegetation plots (n=14).

Species	Name	Cover (%)	Frequency (%)
FEID	<i>Festuca idahoensis</i>	50.2	100.0
RHCAC5	<i>Rhamnus californica</i>	14.2	92.9
DACA3	<i>Danthonia californica</i>	11.8	100.0
ARNE	<i>Arctostaphylos nevadensis</i>	10.7	85.7
CAREX	<i>Carex</i> unknown	7.7	100.0
FECA	<i>Festuca californica</i>	7.3	85.7
CEPU	<i>Ceanothus pumilus</i>	7.1	100.0
SIMA2	<i>Sidalcea malviflora</i>	4.3	64.3
HODI	<i>Holodiscus discolor</i>	4.1	42.9
DECEG3	<i>Deschampsia cespitosa</i> ssp. <i>genuina</i>	4.0	78.6
ELGL	<i>Elymus glaucus</i>	3.8	85.7
BRCAC	<i>Bromus carinatus</i> var. <i>carinatus</i>	2.9	78.6
ZIMI2	<i>Zigadenus micranthus</i>	2.8	71.4
IRIN	<i>Iris innominata</i>	2.4	42.9
HOSE	<i>Horkelia sericata</i>	2.0	50.0
ACMI2	<i>Achillea millefolium</i>	1.7	92.9

GAAM2	Galium ambiguum	1.5	71.4
VAOV2	Vaccinium ovatum	1.5	28.6
TRLOE2	Trifolium longipes var. elmeri	1.4	50.0
LUCO6	Luzula comosa	0.6	57.1
SAPE7	Sanicula peckiana	0.6	42.9
VICU2	Viola cuneata	0.4	14.3
MINU	Minuartia unknown	0.3	35.7
SIBE	Sisyrinchium bellum	0.2	28.6
ROGY	Rosa gymnocarpa	0.2	28.6
POCA5	Polygala californica	0.1	14.3
LATHY	Lathyrus unknown	0.1	14.3
COHE2	Collomia heterophylla	0.1	7.1

Whiskeytown National Recreation Area

Whiskeytown contains 6 monitoring types: Black Oak Woodland, Live Oak Woodland, Mixed Conifer, Ponderosa Pine, Chaparral, and Knobcone Pine. Previously analyzed objectives have been included below. All results shown in Table 9 include 80% confidence intervals of the mean. Minimum sample size has not been attained for any monitoring type at Whiskeytown.

Fire effects sampling at WHIS in 2015 focused on 01YR01 RA plot reads in the Boulder Cr. mechanical thin and conifer removal (N=10), photo-point monitoring in East Boundary Rx units (N=15), and 02YR02 FMH plots (N=6) in Coggins Park mixed conifer Subunit2 (summary charts are presented after Table 5).

Table 5. 2013 Management Objectives and Monitoring Results

Monitoring Unit	Management Objective	Monitoring Results (80% confidence interval)	Objective Achieved?	Year Last Analysis Completed
Chaparral	Maintain dead surface fuel loading between 2-10 tons/acre	00PRE: 16.2 (11.2—21.3) tons/acre 01POST: 6.2 (0.2—12.1) tons/acre 01YR01: 7.5 (1.1—13.8) tons/acre (n= 4 plots, 2 fires)	Yes	2009
Oak Woodland	Maintain average overstory* tree densities of 5-50 trees/acre *live trees >10" DBH	00PRE: 55 (47—63) trees/acre 01YR01: 42 (33—51) trees/acre 01YR02: 33 (23—42) trees/acre (n= 9 plots, 4 fires)	Yes	2010
	Maintain average overstory* tree densities of 5-50 trees/acre *live trees >10" DBH	00PRE: 59 (46—72) trees/acre 01YR01: 45 (29—62) trees/acre 01YR02: 38 (23—53) trees/acre 01YR05: 41 (31—52) trees/acre 01YR15: 49 (33—65) trees/acre (n = 5 plots, 1 fire)	Yes	2010
	Maintain average pole-sized* tree densities between 20-	00PRE: 318 (240—396) trees/acre 01YR01: 168 (87—249) trees/acre	No	2010

Monitoring Unit	Management Objective	Monitoring Results (80% confidence interval)	Objective Achieved?	Year Last Analysis Completed
	100 trees/acre <i>*live trees <10" DBH</i>	01YR02: 148 (73—223) trees/acre (<i>n</i> = 9 plots, 4 fires)		
	Maintain average pole-sized* tree densities between 20-100 trees/acre <i>*live trees <10" DBH</i>	00PRE: 350 (199—501) trees/acre 01YR01: 272 (107—437) trees/acre 01YR02: 239 (85—392) trees/acre 01YR05: 216 (78—353) trees/acre 01YR15: 183 (97—269) trees/acre (<i>n</i> = 4 plots, 1 fire)	No	2010
	Maintain average total dead surface fuel loads between 5-15 tons/acre	00PRE: 20.6 (19.3—21.9) tons/acre 01POST: 3.8 (2.9—4.7) tons/acre 01YR01: 7.6 (4.0—11.2) tons/acre 01YR02: 8.7 (5.6—11.8) tons/acre (<i>n</i> = 9 plots, 4 fires)	Yes	2010
	Maintain average total dead surface fuel loads between 5-15 tons/acre	00PRE: 20.2 (18.0—22.4) tons/acre 01POST: 3.4 (2.3—4.5) tons/acre 01YR01: 10.1 (3.1—16.9) tons/acre 01YR02: 10.3 (5.0—15.6) tons/acre 01YR05: 23.7 (13.9—33.5) tons/acre 01YR15: 19.2 (15.8—22.6) tons/acre (<i>n</i> = 5 plots, 1 fire)	Yes, then no	2010
Knobcone Pine Woodland	Maintain total dead surface fuel loads between 8-35 tons/acre	00PRE: 13.7 (10.8—16.6) tons/acre 02POST: 27.3 (15.5—39.0) tons/acre 02YR02: 42.4 (33.2—51.6) tons/acre 02YR05: 44.4 (31.9—56.9) tons/acre (<i>n</i> = 5 plots, 2 fires)	Not really	2009
Mixed Conifer Forest	Maintain 10-65 overstory* trees/acre <i>*live trees >10" DBH</i>	00PRE: 39 (30—49) trees/acre 01YR15: 61 (46—76) trees/acre 02YR01: 67 (50—83) trees/acre (<i>n</i> = 6 plots, 2 fires)	No, but close	2014 (1993-2014)
	Maintain average pole-sized* tree density between 10-80 trees/acre <i>*live trees <10" DBH</i>	00PRE: 313 (170—455) trees/acre 01YR15: 166 (76—257) trees/acre 02YR01: 143 (64—223) trees/acre (<i>n</i> = 6 plots, 2 fires)	No	2014 (1993-2014)
	Maintain basal area of 75-200 ft ² /acre	00PRE: 160.4 (105.9—214.9) ft ² /acre 01YR01: 160.0 (107.2—212.8) ft ² /acre 01YR02: 143.2 (95.0—191.4) ft ² /acre 01YR05: 133.2 (83.7—182.7) ft ² /acre (<i>n</i> = 9 plots, 2 fires)	Yes	2009
	Maintain basal area of 75-200 ft ² /acre	00PRE: 75.1 (43.1—107.1) ft ² /acre 01YR01: 81.2 (49.6—112.8) ft ² /acre 01YR02: 83.2 (51.8—114.6) ft ² /acre 01YR05: 80.5 (56.7—104.3) ft ² /acre 01YR15: 109.9 (79.4—140.4) ft ² /acre (<i>n</i> = 5 plots, 1 fire)	Yes	2009
	Maintain dead surface fuel load between 10-35 tons/acre	00PRE: 21.0 (17.1—24.8) tons/acre 01POST: 10.3 (4.8—15.8) tons/acre 01YR15: 14.2 (12.1—16.4) tons/acre 02YR01: 9.5 (4.8—15.8) tons/acre	No, but close	2014 (1993-2014)

Monitoring Unit	Management Objective	Monitoring Results (80% confidence interval)	Objective Achieved?	Year Last Analysis Completed
		(<i>n</i> = 5 plots, 2 fires)		
	Maintain dead surface fuel load between 10-35 tons/acre	00PRE: 19.7 (15.5—23.9) tons/acre 01YR01: 8.5 (4.9—12.2) tons/acre 01YR02: 13.1 (4.9—21.2) tons/acre 01YR05: 17.9 (15.1—20.7) tons/acre 01YR15: 15.4 (13.8—17.0) tons/acre (<i>n</i> = 5 plots, 1 fire)	Yes	2009
Ponderosa Pine Forest	Maintain average overstory* tree densities between 15-45 trees/acre *live trees >10" DBH	00PRE: 92 (69—115) trees/acre 01YR01: 87 (67—106) trees/acre (<i>n</i> = 5 plots, 3 fires)	No	2009
	Maintain average overstory* tree densities between 15-45 trees/acre *live trees >10" DBH	00PRE: 105 (71—140) trees/acre 01YR01: 94 (64—124) trees/acre 01YR02: 85 (67—103) trees/acre 02YR02: 81 (69—93) trees/acre 02YR05: 74 (61—88) trees/acre 02YR10: 77 (59—95) trees/acre 03YR01: 76 (53—98) trees/acre 03YR02: 63 (34—93) trees/acre (<i>n</i> = 3 plots, 4 fires)	No	2010
	Maintain 10-75 pole-sized* trees/acre *live trees <10" DBH	00PRE: 424 (299—549) trees/acre 01YR01: 262 (88—436) trees/acre (<i>n</i> = 5 plots, 3 fires)	No	2009
	Maintain 10-75 pole-sized* trees/acre *live trees <10" DBH	00PRE: 301 (197—404) trees/acre 01YR01: 80 (11—148) trees/acre 01YR02: 63 (0—146) trees/acre 02YR02: 45 (0—94) trees/acre 02YR05: 32 (0—73) trees/acre 02YR10: 36 (5—68) trees/acre 03YR01: 14 (1—26) trees/acre 03YR02: 12 (1—24) trees/acre (<i>n</i> = 3 plots, 4 fires)	Yes	2010
	Maintain average dead surface fuel load of 5-28 tons/acre	00PRE: 32.3 (26.3—38.3) tons/acre 01YR01: 23.7 (0.0—47.4) tons/acre (<i>n</i> = 5 plots, 3 fires)	Yes	2009
	Maintain average dead surface fuel load of 5-28 tons/acre	00PRE: 29.7 (24.7—34.6) tons/acre 01POST: 5.3 (2.1—8.5) tons/acre 01YR01: 10.1 (6.2—14.0) tons/acre 02POST: 5.6 (4.9—6.2) tons/acre 02YR02: 16.4 (5.2—27.5) tons/acre 02YR05: 29.3 (14.0—44.5) tons/acre 02YR10: 30.8 (23.5—38.1) tons/acre 03POST: 12.2 (10.3—14.0) tons/acre 03YR01: 12.9 (11.4—14.5) tons/acre 03YR02: 15.8 (9.0—22.6) tons/acre (<i>n</i> = 3 plots, 4 fires)	Generally yes	2010

Coggins Park Mixed Conifer Rx Burn Subunit 2 (N=6 FMH plots)

Data representing stand structure and fuel loading are presented below for Coggins Park Subunit 2, from 6 FMH plots measured at 01YR15, 02YR01, and 02YR02.

Figure 1. Diameter distribution at 01YR15, 02YR01, and 02YR02.

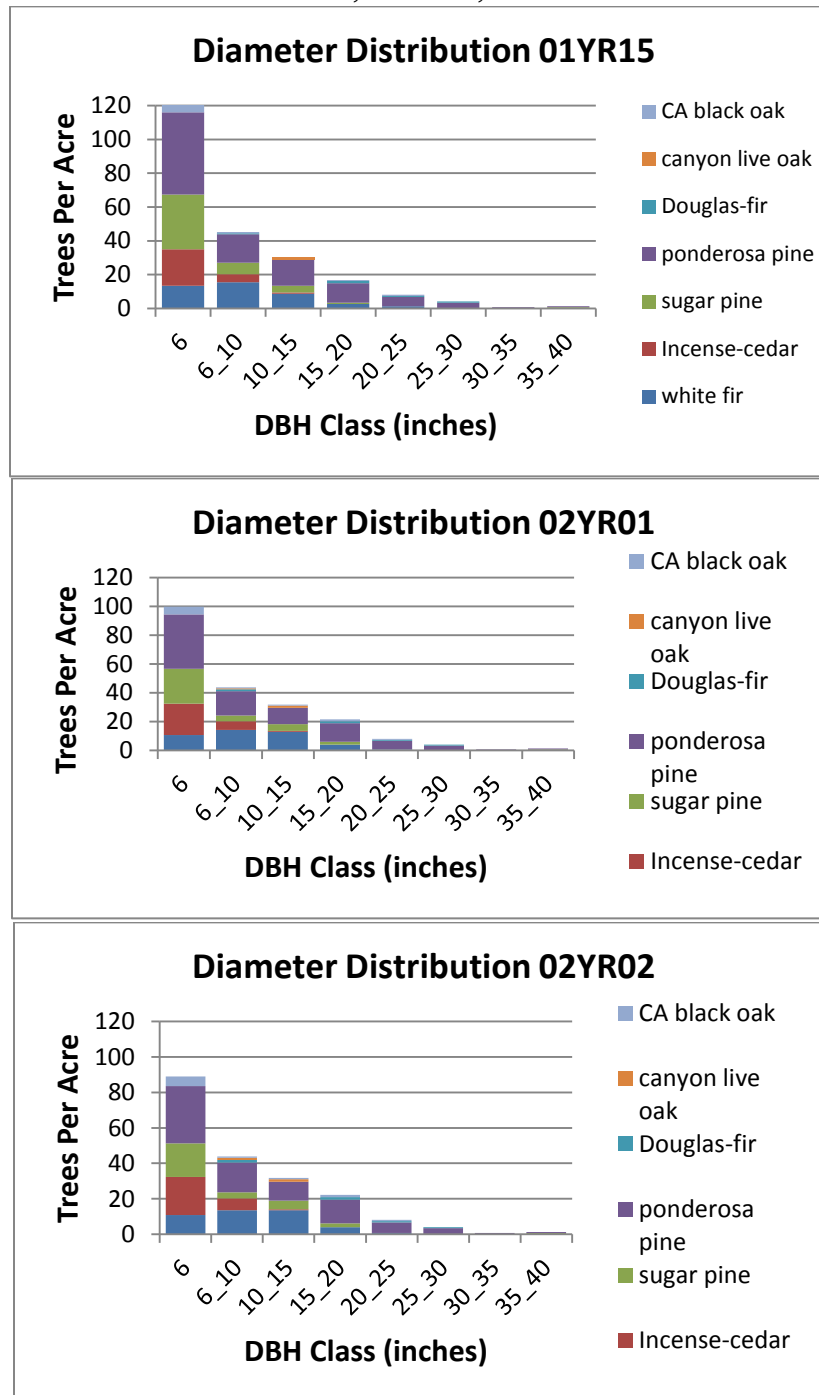


Figure 2. Pole (<10 in) and Overstory (>10 in) Basal Area at 01YR15, 02YR01, and 02YR02.

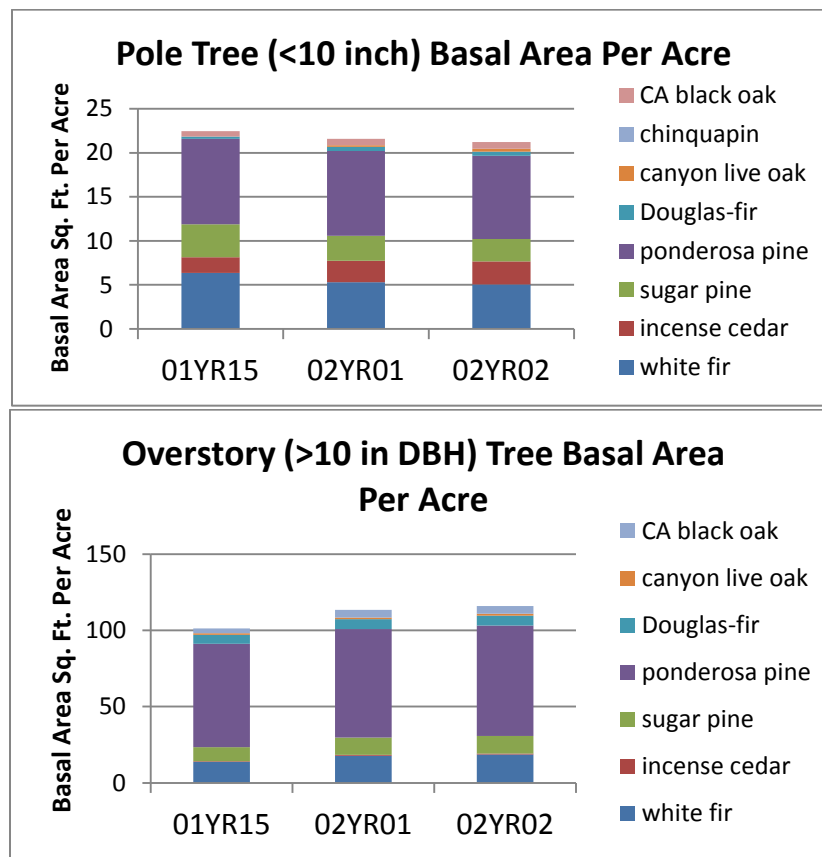


Figure 3. Pole (<10 in) and Overstory (>10 in) Density at 01YR15, 02YR01, and 02YR02.

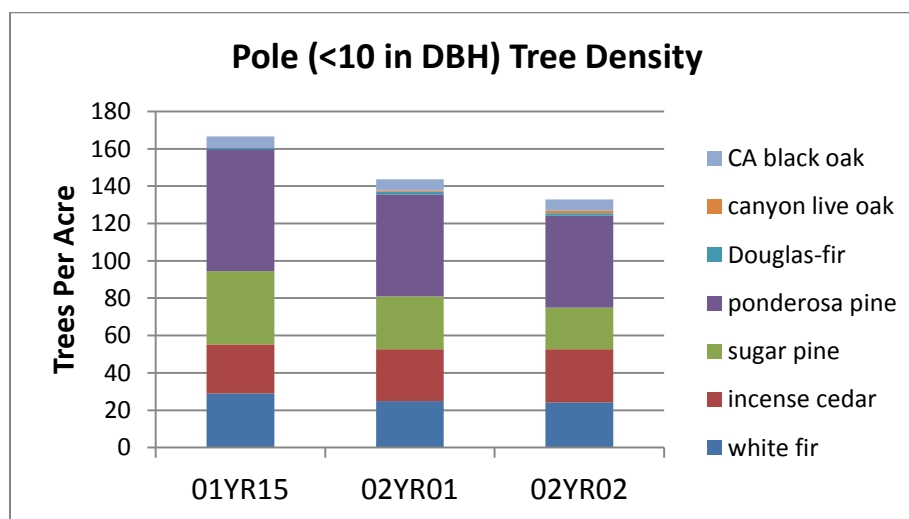


Figure 3 Continued.

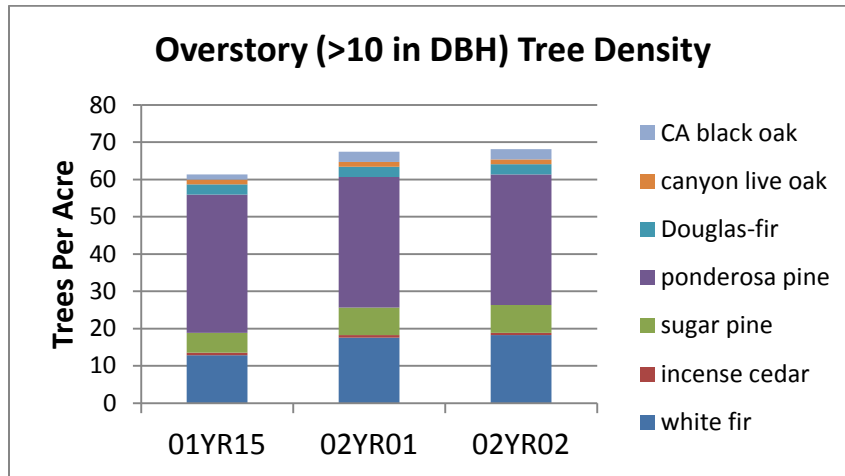


Figure 4. Woody fuel loading (1-1000 Hr fuels) at 01YR15, 02YR01, and 02YR02.

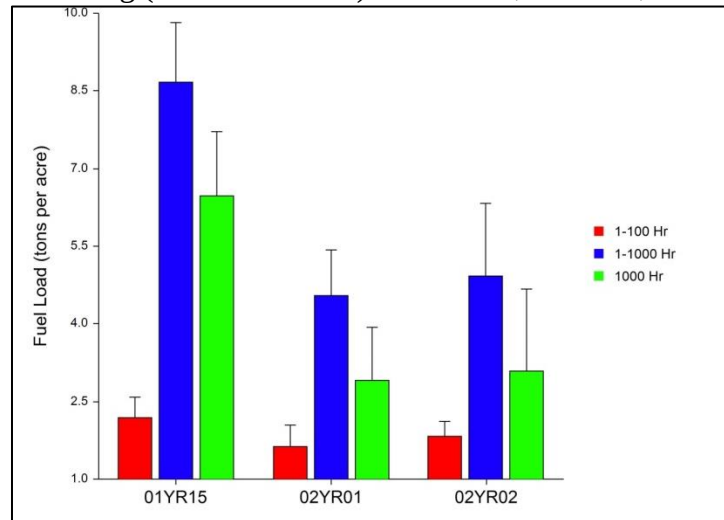


Figure 4. Litter and Duff depth (in) at 01YR15, 02YR01, and 02YR02.

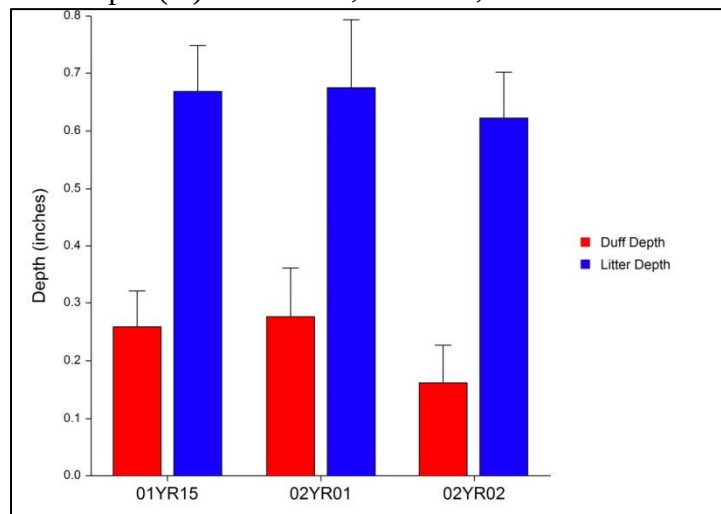


Figure 5. Photo-Points at 01YR15 (Left column) and 02YR02 (Right column) in Coggins 2.



Boulder Creek Mechanical Thin and Oak Restoration (N=10 RA plots)

Data representing stand structure and fuel loading are presented below for Boulder Creek Mechanical Thin for PRE and 01YR01 plot reads.

Figure 1. Tree density for living and dead Poles (1-11 in DBH) and Overstory (>11 in DBH) Pre-treatment and 1 year following thin.

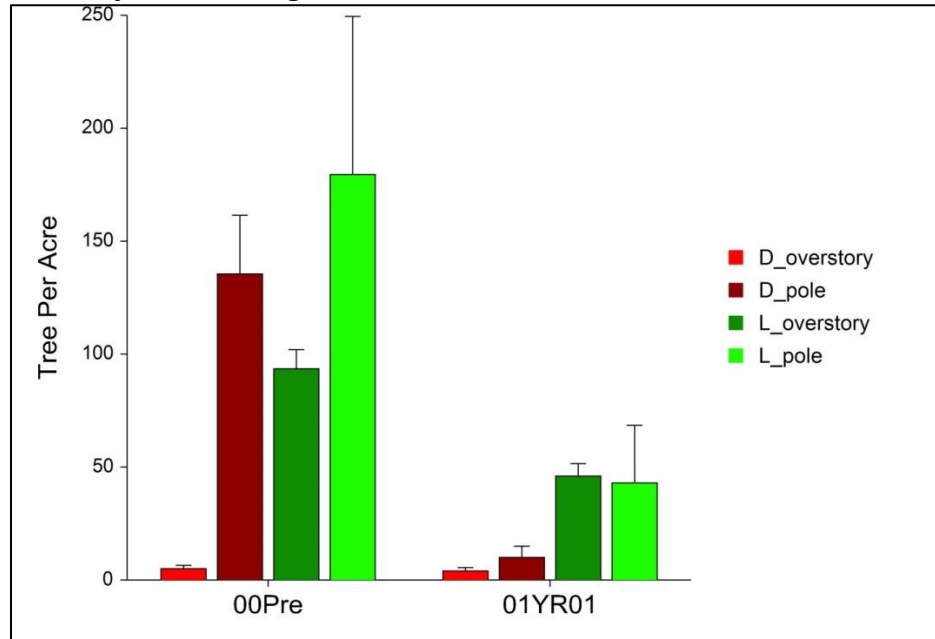


Figure 2. Tree Basal Area for living and dead Poles (1-11 in DBH) and Overstory (>11 in DBH) Pre-treatment and 1 year following thin.

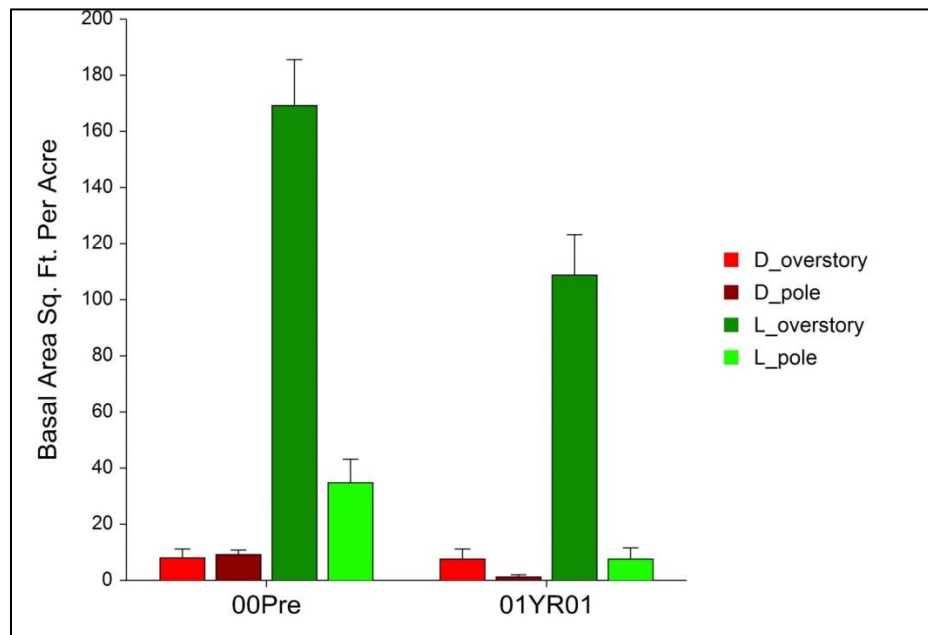


Figure 3. Tree diameter distribution in the Boulder Creek Mechanical project Pre-treatment and 1 year following thin.

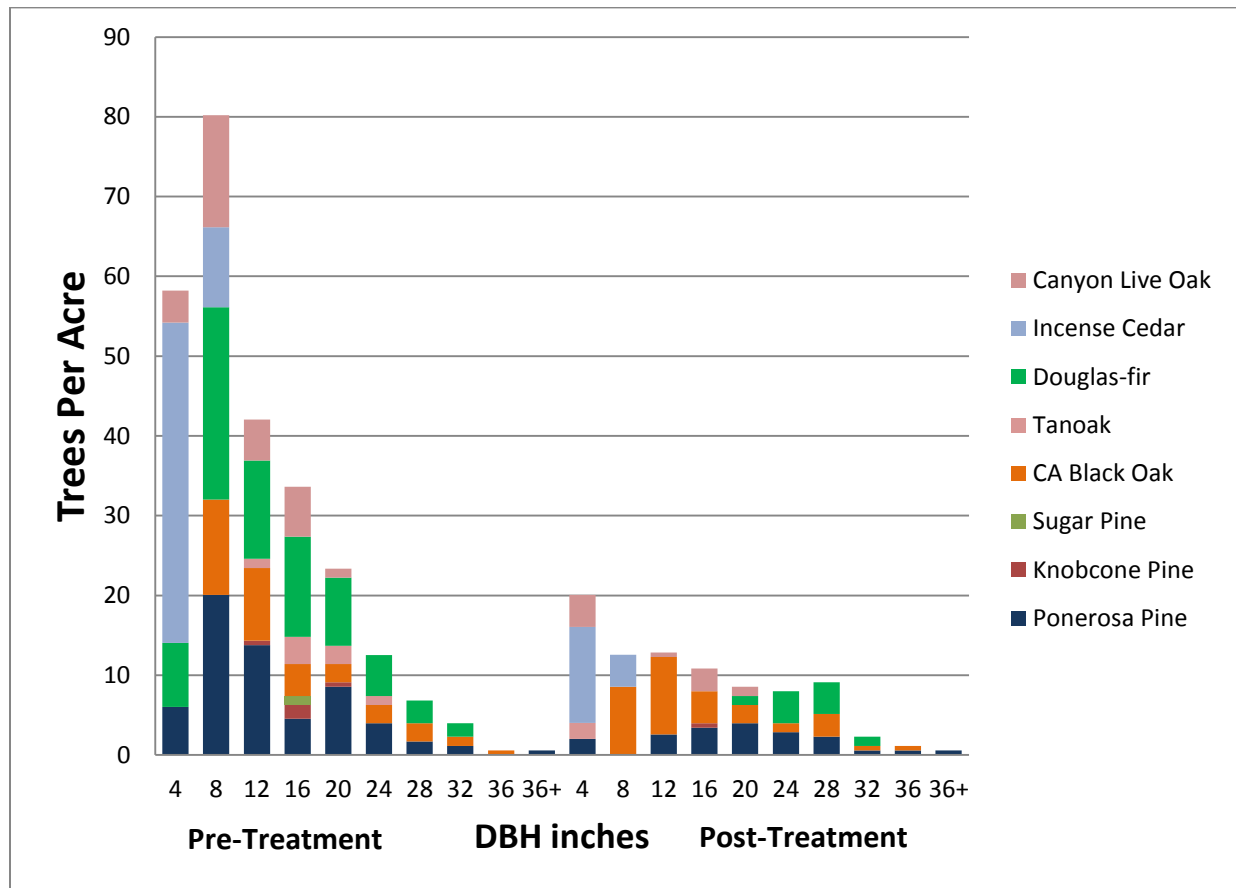


Figure 4. Forest composition (%) in the Boulder Creek Mechanical project Pre (a) and 1 YR Post (b) treatment.

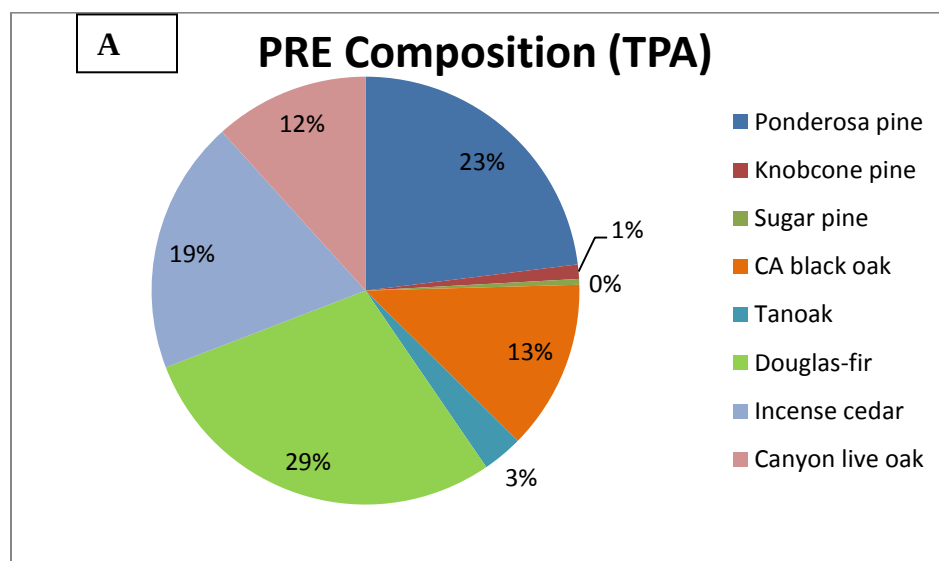


Figure 4 Continued.

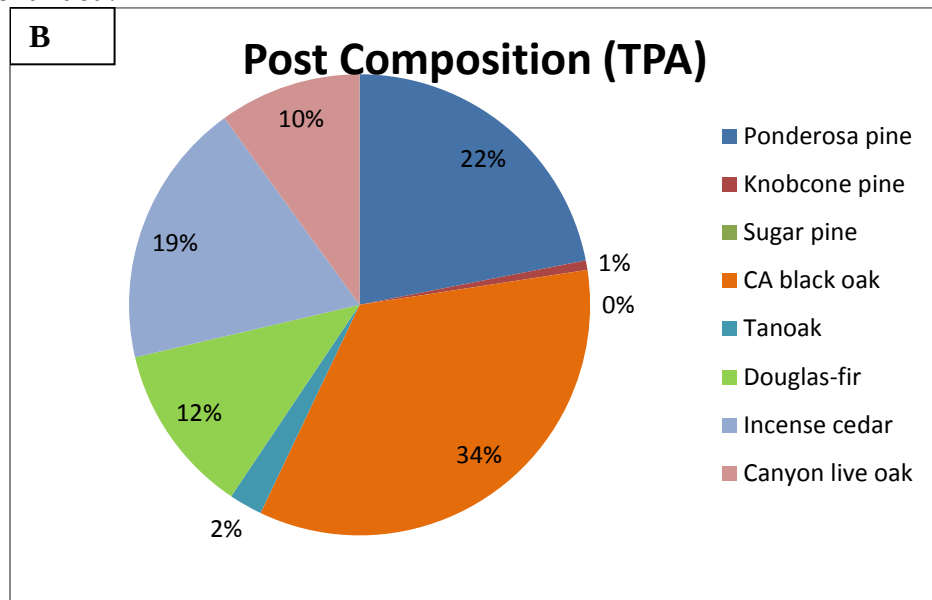


Figure 5. Woody fuel loading (1-100 Hr fuels) at Pre and 1 YR Post treatment.

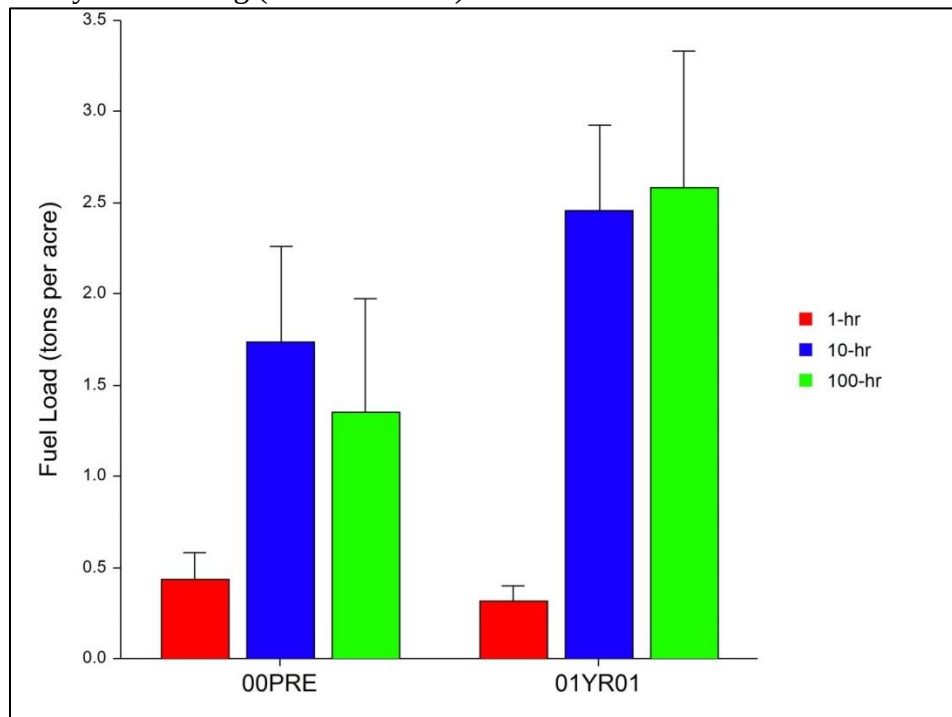
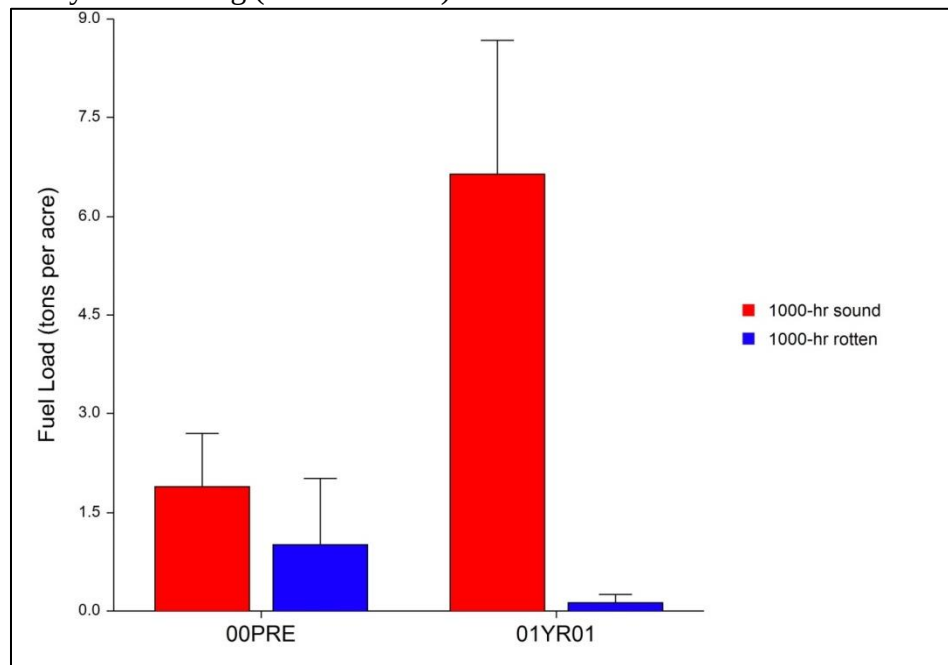


Figure 6. Woody fuel loading (1000 Hr fuels) at Pre and 1 YR Post treatment.



Oregon Caves National Monument

Oregon Caves contains three monitoring types: Douglas-Fir (FMH) – 8 plots, CC9 (Rapid Assessment) – 4 plots, and Horseshoe Shaded Fuelbreak (HSFB-Rapid Assessment) – 7 plots. HSFB2 has been thinned and pile burned, and in 2014/2015 further thinning was completed HSFB3. Three RA plots were installed in HFSB3 pre-treatment. The post-thinning assessment will be completed in HSFB3 in 2016 after piles are burned, and all 7 RA plots will be analyzed following the 2016 sample event. Specific monitoring objectives for thinning and pile burning at ORCA are in review. Minimum sample size has not been achieved for any monitoring type at Oregon Caves. Previous analysis for the Douglas-fir vegetation type is included below.

In February 2015, the Fire Ecologist met with the Fuels Specialist, Fire Management Officer, and Resource staff at ORCA to discuss the newly created Preserve, including updates necessary for the FMP, future fuels work, Resource Advisor guidelines, and interagency fire management issues. Currently a Lidar analysis is underway by the University of Washington to assist with fuel treatment and forest management planning in the Preserve.

Table 6. Management Objectives and Monitoring Results for Oregon Caves.

Monitoring Unit	Management Objective	Monitoring Results (80% confidence interval)	Objective Achieved?	Year Last Analysis Completed
Douglas-fir (FPSME1D10)	At immediate postburn: Reduce total fuel load by 20-50% from preburn levels	Reduction in total dead surface fuel load: -71.5% PRE: 115.5 (0 – 235) tons/acre YR01: 32.9 (11.3–54.5) tons/acre (n = 3 plots, 2 fires)	No	2008

Monitoring Unit	Management Objective	Monitoring Results (80% confidence interval)	Objective Achieved?	Year Last Analysis Completed
	At three years postburn: Limit mortality of large overstory trees, >60 cm DBH, to <10% of preburn levels	0% change from preburn (<i>n</i> = 3 plots, 2 fires)	Yes	2008

B. Program Information

Table 4. Planning - 2015

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 2014)	Assisted with how many BAER plans in 2014?
Redwood National Park	YES	2010	4 (FMH program; Fir plots; second growth RA, Jeffrey Pine RA)	0
Whiskeytown National Recreation Area	YES	2012	4 (FMH program; Mechanical RA; shaded fuelbreak; photo-point)	0
Oregon Caves National Monument	NO	2013	2 (FMH; Fuelbreak RA)	0

Table 5. Monitoring - 2015

Park	% 2015 Data Entered	% 2015 Data Quality Checked	# Prescribed Fires Monitored*	# Non-fire Fuels Treatments Monitored*	# Wildfires Monitored*	# BAER Treatments Monitored*
Redwood National Park	95%	90%	3	1	0	0
Whiskeytown National Recreation Area	100%	90%	1	1	0	0
Oregon Caves National Monument	n/a	n/a	0	0	0	0

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

Table 6. Communicating Results - 2015

Park	# of Project Monitoring Reports completed in 2015	# of Annual meeting(s) with Park staff	# of Formal presentations of results	Do you use Minitab?*
Redwood National Park	2	4	1	n
Whiskeytown National Recreation Area	1	3	0	n
Oregon Caves National Monument	0	1	0	n

* This information will help to assess Minitab multi-user license needs.

Table 7. Research - 2015

Park	Are research needs identified in FMP or Monitoring Plan? (yes or no)	# of Proposals Submitted in 2015	# of Proposals Funded in 2015	# of Research Projects Supported in 2015*	Additional Comments
Redwood National Park	Not really	1	2	2	
Whiskeytown National Recreation Area	Yes (but needs to be updated)	0	0	2	
Oregon Caves National Monument	No	0	0	0	

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

Reserve Fund Research

See section on Little Bald Hills in Redwood portion of report.

Also, if a Reserve Fund research project is completed, please remember to submit an article to the Rx Effects newsletter (see <http://www.nps.gov/fire/wildland-fire/what-we-do/science-ecology-and-research/rx-effects-newsletter.cfm> for submission guidelines).

C. Fire ecologist accomplishments and areas of focus

Table 8. Fire Ecologist 2015 Accomplishments/Focus Areas

Category	Percent Time	Accomplishments and/or areas of activities
Planning	20 %	Rx plan development, FMP updates, meetings about ongoing projects at parks
Presentations	4%	Presenter at 2015 Klamath Conversion Day; Oak woodland symposium hosted by UCCE; Arcata Marsh speaker series
NPS Meetings/	10%	READ, Climate Issues in parks, Lower Prairie Creek project at REDW

task groups		
Interagency work	15%	Work with Six Rivers NF (WFDSS, fuel moisture program, meetings)
Wildfire assignments	10%	Three fire assignments.
Prescribed fire projects	2%	FEMO for 3 Rx fires at REDW
Non-fire fuels projects	2%	Conifer removal projects at REDW
Research	8%	Fire Effects in 2 nd Growth Redwood (Save the Redwoods League funds), collaboration with USGS; Jeffrey Pine Savanna Reserve Fund project
Data collection	10%	Assisted with all fieldwork at REDW, WHIS, ORCA, in collaboration with vegetation management staff and USGS staff
Data entry	5%	Data management for REDW, WHIS, and ORCA
Data analysis	5%	Estimated amount of time spent performing analyses, including data summaries and statistical tests.
Supervision/Admin	2%	Volunteers, Interns and techs at REDW
Training	2%	Fire refresher, PT
Travel out-of-park for plot or project work	5%	WHIS and ORCA site visits
Miscellaneous		

E. 2016 Direction

Current focus in the KLMN is hiring a shared crew between the East and West sides. This crew could service the entire network, and there may be opportunities to collaborate with USGS. Additionally, more emphasis in the fire ecology program has been focused on searching for alternative funds for specific research projects, non-FMH plot sampling, and interagency work with Six Rivers NF.

F. Overall Data Entry Status and FFI suggestions

Program Data - In an effort to ensure the longevity of NPS fire effects monitoring data, please provide the following:

- Estimate of the percentage of your park/network **total** monitoring program data (including past and present data) that has been entered into FFI, or another application, and quality checked (e.g. Are there any non-digital, hard copies of data still floating around out there?)
This is a ROUGH estimate, but approximately 95% entered and 90% quality checked.
- Do you have a need for migration of any data to FFI? (if so, briefly describe the dataset, e.g. 20 Excel spreadsheets with fuels data)
We have a couple projects that could be migrated into FFI, but the need is not urgent. Approximately 15 excel sheets with overstory, veg., and fuels data.