

**Fire effects monitoring report for
2016 Ashland watershed TREX prescribed burns
Forest Service Unit 14b and Rollins Property**

Keith Perchemlides, The Nature Conservancy, April 26, 2017

Unit names: Rollins Property, AFR Unit 14b

Burn Dates: May 17 and May 18, 2016

Burn Bosses: Colby Smith (Rollins),
Jeremy DeLack (14b)

Fuel Types: Timber litter, timber
understory, shrub

Primary Fuel Models: TL3 and TU2

Acres Planned: Rollins: 15 ac; 14b: 27 ac

Acres Burned: Rollins: 9 ac; 14b: 27 ac

FEMOs: Keith Perchemlides, Jean Volpe



Purpose and Resource Management Goals

These burns were part of the landscape-scale forest stewardship work of the Ashland Forest Resiliency (AFR) project (Unit 14b) and the Ashland Forest All-Lands Restoration (AFAR) initiative (Rollins Property) conducted by a partnership of the U.S. Forest Service (USFS), City of Ashland (COA), Lomakatsi Restoration Project (LRP), and The Nature Conservancy (TNC). The burns were conducted by diverse crews including training participants and partnership staff as part of the 2016 Ashland Fire Training Exchange (TREX). Management goals included reducing fuel loads and fire risk, and reintroducing beneficial fire for ecological restoration while protecting wildlife habitat values. Both units are in easily accessible areas and crossed by roads or trails with a high level of public use, making these burns important for forest stewardship demonstration and outreach goals.

Prescribed Fire Objectives

In 2016, the AFR partnership approved a standard set of prescribed burn objectives for all AFR burns in the Ashland watershed. These objectives are also applicable to private land burns under the AFAR initiative.

1. **Reduce litter and light surface fuels (1 to 100 hr) by 30 - 80%**
2. **Reduce understory trees (< 5" dbh) and shrubs by 30 - 80%**
3. **Limit mortality of intermediate trees (5-12" dbh) to < 40%**
4. **Retain > 90% dominant/codominant trees (> 12" dbh)**
5. **Minimize mortality of legacy trees (large, old trees with complex form, providing important habitat value)**
6. **Retain overall effective ground cover for the unit based on soil erosion hazard class: Moderate (< 35% gradient), > 60% year-1, > 70% year-2; Severe or higher (> 35% gradient), > 70% year-1, > 85% year-2**
7. **Retain approximately 90% large down logs or snags (>20" diameter)**
8. **Minimize fire intensity in leave areas**

Unit Descriptions

Unit 14b (26.7 acres) and the Rollins unit (9.4 acres) are in close proximity along Forest Service Road 2060 (Map 1) with similar stand structure, composition, and fuels. Both units contain dry mixed conifer forest characterized by Douglas fir, Ponderosa pine, white fir, madrone, and black oak, with manzanita and buckbrush shrub species in the understory or as small patches in openings. Average canopy closure for both units was approximately 70% pre- and post-burn. Both units were recently thinned and pile-burned to reduce surface and ladder fuels, resulting in open understories and relatively low surface fuel loads. Pre-burn the characteristic fuels for both units were a patchwork of light to moderate timber litter (TL1 and TL3) or timber understory with live shrub and herbaceous fuels (TU1 and TU2) (Scott and Burgan 2005). Unit 14b is on public USFS land with a high level of recreational use, accessed by Road 2060 and traversed by multiple hiking trails. Most of the 14b unit is on a west-facing aspect at an elevation of roughly 3200 feet with variable slope averaging < 35%. The Rollins unit is at an elevation of approximately 2700 feet on private land bisected by the forest access road and unofficial trails. This NE aspect unit was generally steeper, with an average slope > 35%. Map 1 shows the final unit perimeters, contour topography, forest roads, and canopy cover.

Prescribed Fire Implementation Summary

Burn operations were completed within a single day for each unit. The Rollins property burn was conducted as a TREX operation with a diverse crew; Unit 14b was lead by the Forest Service and local contractor Greyback Forestry with TREX participants assisting. Fire weather and fuel moisture were within prescription range during both burns, but with relative humidity (RH) higher than desired and wind speed lower than desired. Fire behavior typically remained within prescription range on both units, tending to the low end of intensity for flame length and rate of spread (ROS), and dropping off to zero where fire would not carry on much of the north sections of Unit 14b and the southeast portion of the Rollins property (Map 1). Table 1 below summarizes fire weather and fuel conditions during each of the burns. Below are timelines and operations narratives for the Rollins burn and Unit 14b.

Rollins Unit, 5/17/2016

1200 – Briefing. Hose lays and hand-lines established along southern boundary of unit above and below Road 2060.

Unit perimeter adjusted from original plan to leave out approximately 2 acres on the NW corner of the unit.

1240 – Test fire on SW corner of unit at top of east-aspect slope, highest point in unit. Flame length (FL) 0.5' – 1', low ROS < 1 ft/min. Good carry through surface fuels, decision to continue ignitions.

1300 – Active ignitions in bump strip pattern, 10' spacing with 2 crews working N – S and meeting in center. Good intensity in desired prescription range, strips closing on slope above road: FL 1' – 2', ROS 1 – 2 ft/min.

1340 – Ignitions approaching bottom of slope above road, more open canopy. Switch to single crew and SE-NW strip lighting, tighten spacing of lines to 6'. Strips closing rapidly, FL 1.5' – 2.5', ROS 10 ft/min.

1400 – Smoke plume lifting, dispersing east – see photo at end of report.

1450 – Ignitions completed above road.

1500 – Ignition crews re-group on road, test burn at top of east-aspect slope below road.

1520 – Decision to continue ignitions. Single lighting crew works across east-aspect slope below road, N-S strips with 5' – 10' spacing. Variable carry and consumption diminishing towards moist draw running NE from south boundary of unit and separating the east and north aspect slopes below road. FL 0.5' – 1', ROS 2 – 5 ft/min, strips +/- closing.

1645 – Ignitions completed on east aspect slope. Holding crews adjust unit perimeter cutting new handline to exclude approximately 3.5 acres on the NE portion of the unit where conditions were deemed too moist to burn.

1700 – Ignition crew regroups to attempt lighting on the north-aspect slope in the southeast portion of the unit. Some spot burning in fuel accumulations but generally fire not carrying or consuming in moister, more shaded fuels. Some smoldering in heavier fuels and holding works to keep fire out of old burn piles of 1000+ hour fuels.

1830 – Stopped all ignitions, unable to successfully burn on north-aspect slope, burn window closed. Transition to mop-up.

2000 – Mop-up completed, AAR on Road 2060.

AFR Unit 14b, 5/18/2016

0815 – Briefing at trailhead off of Road 2060 on western boundary of the unit.

0900 – Crew work to complete unit perimeter of handlines tying into trails and roads, and hose lay along the southern boundary. Final perimeter adjusted down from burn plan extent, leaving out north and east portions of plan unit.

1030 – Unit fully prepped. Ignitions briefing at trail-head. Crews move to SE corner of unit for test burn.

1145 – Test burn on SE corner, highest point on unit. Weak ROS and carry with conditions barely in low prescription range, but decision to proceed with ignitions moving out of shaded SE corner and onto drier more exposed west-aspect main slope of unit.

1200 – Ignitions moving downslope on west-aspect slope of unit, 10' spacing on N – S strips. Unburned piles torching with spot FL > 15', but mainly fire creeping in sparse needle litter, FL 0.25' – 1', ROS 2 – 5 ft/min upslope with wind. Strips not closing initially, patchy burn especially where green herbaceous abundant.

1215 – Fire intensity picks up as ignitions move onto steeper portion of lower west-aspect slope. FL 1' – 1.5', ROS 3 – 5 ft/min, strips closing, good consumption of litter and surface fuels. Smoke lifting and dispersing S/SW, but also smoke shading the upslope near ridge and suppressing fire activity from earlier ignitions there.

1300 – Ignition crews completing the west-aspect slope down to trailhead working in SW-NE strips, 10' spacing. Good consumption and strips closing through most of area, FL 1' – 2', ROS 10 ft/min.

1400 – Ignitions crews regroup in northern portion of the unit. Skip over large (2+ acre) chip-mulched landing area and hand-line around to avoid smoldering fire and holding concerns.

1420 – Smoke lifting and dispersing W/SW – see photo at end of report.

1430 – Ignitions start on the NW portion of the unit, north aspect with moist, shaded fuels and high canopy cover. Fire not carrying, flames spotty, FL < 0.5', little or no consumption, strips not closing.

1445 – Ignitions extend onto NE portion of unit, NE aspect ridge with abundant green herbaceous fuels. Fire not carrying, limited patchy burn in accumulations only, FL < 0.5', lines discontinuous.

1500 – Ignitions ceased, transition to mop-up.

1730 – Mop-up completed, AAR at trailhead.

Fire Effects Monitoring Method

Our fire effects monitoring directly tracks the standard AFR-wide set of eight objectives listed above. Each objective is linked to a specific monitoring indicator recorded in pre- and post-burn plots, with additional metrics to characterize the unit or inform fire or smoke modeling, and repeat photographs to document fire behavior and effects. Monitoring plots are 0.1 acre, circular, and distributed throughout the unit to capture the range of fuels, topographic settings, stand types, and fire effects. We typically collect pre-treatment plot data shortly before the burn, record fire weather, behavior, and ignitions during the burn, and return in the fall to collect post-burn data and photos. Table 2 below lists and defines the specific data we record, with notes on field protocol and the purpose of each indicator. In the Ashland watershed where loose decomposed granite soils and steep slopes create an erosion risk we give special attention to ground cover retention, measuring effective ground cover (EGC) pre- and post-burn. We also complete post-burn unit

walk-throughs to map the final perimeter, assess some objectives not captured at the plot scale (see Table 2), and verify that our plot data are representative.

Fire behavior and effects varied across both the Rollins and 14b units responding to topography, vegetation, fuel loads and moisture. Post-burn we mapped sub-areas of different fire effects within each unit (Map 1). These sub-areas each contained one or more monitoring plots and were used to calculate area-weighted averages to more accurately summarize unit-scale fire effects from our plot data.

Monitoring Results and Performance on Objectives

Both the 14b and Rollins burns met prescribed fire objectives, including targets for surface fuels, shrub and tree mortality, erosion-preventing surface cover (EGC), and wildlife habitat, except for understory reduction on the Rollins burn. The summary table below presents our monitoring results relative to the burn objective targets on the AFR 14b and Rollins burn units. For ground cover retention, the year-1 results from both units already meet the higher year-2 targets and no further monitoring of EGC is needed. A legacy madrone with a hollow bole suffered damage but not mortality from the fire on the Rollins unit.

Fire effects and fuel consumption were generally good for both burns, but both units contained substantial areas with little or no fire effects despite attempted ignitions. In Unit 14b, approximately 60% of the total unit area burned and the dominant fuel model was reduced from TL3 to TL1, but in the two northern sub-areas of the unit (Map 1) fire effects were very limited and there was no change in fuel model. At the Rollins property, about 50% of the total unit area burned, dropping the fuel load from TL3 to TL2, but with little consumption and no fuel model change in the southeast portion of the unit (Map 1). The lack of heat and consumption in these portions of the units explains why reduction of surface fuels was on the low end of the target range for both and the understory reduction goal was not met on the Rollins property. The portions of both units with minimal fire effects could potentially be available to burn again in 2017 or 2018. At the end of this report a set of repeat photographs from both units document conditions before and after the burns and provide examples of typical fire behavior and smoke.

Summary of monitoring results for achieving burn objectives. Results are presented as area-weighted plot-data averages relative to the sub-unit zones on Map 1, or based on post-burn unit walk-through for objectives 5, 7, and 8.

Objective	Target	AFR 14b	Rollins
1. Litter and light surface fuels reduction	30% - 80%	44%	35%
2. Understory live tree and shrub reduction	30% - 80%	65%	22%
3. Limit mortality of intermediate trees	< 40%	0%	0%
4. Retain dominant/codominant trees	> 90%	100%	100%
5. Minimize mortality of legacy trees	0%	0%	0%
6. Retain effective ground cover (EGC) targets for the relevant unit gradient	Year-1: > 60% (< 35% slope)	77%	
	Year-1: > 70% (> 35% slope)		85%
7. Retain large down logs or snags	> 90%	99%	100%
8. Minimize fire intensity in leave areas	low-none	n/a	n/a

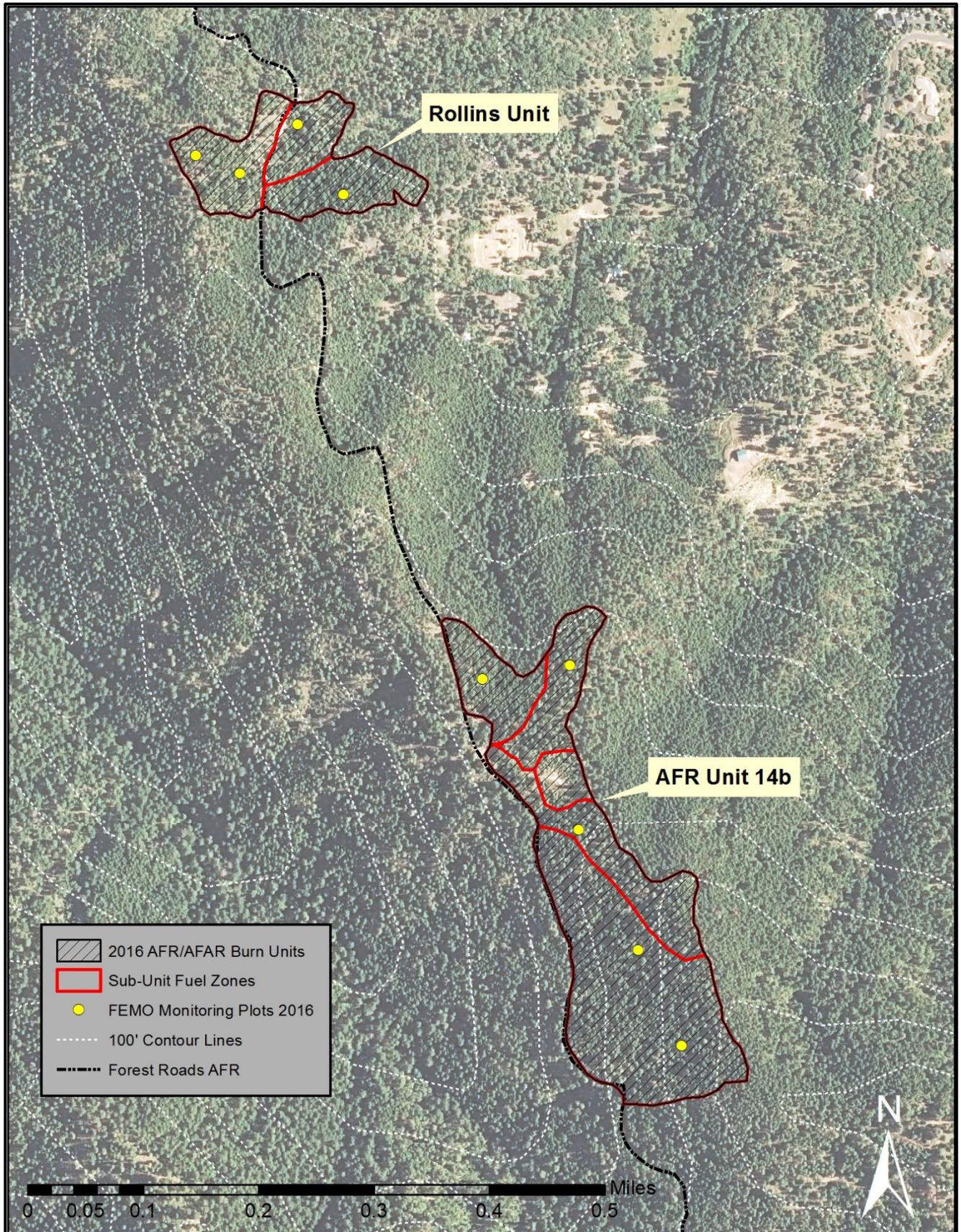
Table 1. Hourly fire weather observations during the Rollins (top) and 14b (bottom) burns. Note that for the Rollins burn, the burn boss requested both shaded and exposed fuels data.

Fire Name: Rollins				Date: 5/17/2016				
TIME	WIND DIRECTION	WIND SPEED	DRY BULB (F)	RELATIVE HUMIDITY	ASPECT	EXPOSED /SHADED	FINE DEAD FUEL MOISTURE	PROBABILITY OF IGNITION
1100	NE	1-2	62	61	NE	E	9	30
						S	12	20
1145	N	0-2	65	58	NE	E	9	30
						S	12	20
1300	NE	0-3	70	53	NE	E	7	50
						S	10	30
1400	NE	1-2	72	47	E	E	7	50
						S	11	50
1500	ENE	0-3	74	45	NE	E	8	40
						S	11	30
1600	NE	1-2	75	39	NE	E	6	60
						S	9	50
1700	N	1-4	74	35	N	E	6	60
						S	9	30
1800	SSE	0-4	75	38	N	E	8	40
						S	10	30
1900	SSW	0-2	71	46	E	E	11	30
						S	12	20

Fire Name: AFR 14b				Date: 5/18/2016				
TIME	WIND DIRECTION	WIND SPEED	DRY BULB (F)	RELATIVE HUMIDITY	ASPECT	EXPOSED /SHADED	FINE DEAD FUEL MOISTURE	PROBABILITY OF IGNITION
900	E	0-1	59	59	NW	S	13	20
1000	NNW	1-2	61	56	W	S	12	20
1115	NNW	1-3	62	52	W	S	11	20
1200	NW	1-2	67	40	W	S	9	30
1300	NW	1-3	66	47	W	S	10	30
1400	N	1-3	74	38	W	S	8	40
1500	N	1-3	75	36	NE	S	8	40
1600	WNW	2-5	76	34	W	S	8	40
1700	NW	1-2	76	31	NW	S	9	30

Table 2. Summary of standard AFR plot-based monitoring method for fire effects and objective attainment.

Data field	Definition and notes	Timing	Purpose
PlotID	Unique plot identifier assigned in GIS = "UnitID-[sequential number]"	pre	
Date-	Monitoring dates. Post-burn done at end of growing season before start of fall rains	both	
PhotoID-	Photo ID number from camera. Photo taken eye level plot center out, representative of stand and fuels, include landmarks near and far to aid repeat photo post-burn, bring pre-burn printed images for post repeat	both	Visual record of unit condition and fire effects
PhotoAzM	Compass bearing in degrees (azimuth), plot center to center of photo	pre	Aids repeat photo
GrndPhotoID	Photo ID number from camera. Pre-burn representative ground fuels and understory, taken from edge to plot center, low horizon, no repeat	pre	Use to estimate Objective 1, surface fuel reduction
Slope%	Clinometer, % slope, average above and below plot if variable	pre	Characterizing unit, informs Objective 6, EGC
Aspect	Compass degrees +/- 5	pre	Characterizing unit, informs Objective 6, EGC
Closure%	Densimeter in four directions, up, down, side slopes, using grid-V with 50 quarter cells per direction, keep running tally and divide by 2	pre	Characterizing unit, informs Objectives 3 - 5, tree mortality
EGC%-	Effective ground cover. Line intercept tally of all surface cover with gaps < 0.1 ft, except exposed soil, along two 25 ft transect from 10 ft to 35 ft from plot center, oriented to bearing of aspect + 45 degrees. Total distance covered along both transects in decimal feet x 2 = % EGC	both	Objective 6, EGC
SBfuel-	Fuel model from Scott and Burgan 40 photo series - select based on what fuels/vegetation will carry the fire, what fuel/veg will significantly affect fire behavior, relative loading (low, mod, high), and relative flame lengths	both	Smoke and fire modeling, characterize unit
CBH(ft)-	Minimum height to nearest foot from ground to continuous (< 2 ft gap) ladder fuels to canopy (not isolated trees), 0.1 if to ground, "0" if no canopy	both	Fire modeling input
AreaBurned%	Percent of total plot area with some visible char or consumption from burn, post-burn only	post	Characterizes post-burn unit
1-100hr%Red	Percent reduction in litter and light surface fuels (1 - 100 hr = litter/grass - 3") post-burn only, reference pre-burn ground fuels photo	post	Objective 1, surface fuel reduction
UstorCvr-	Percent cover of LIVE understory shrubs (>12" ht) and trees (<5" dbh)	both	Objective 2, understory reduction
HerbCvr%-	Percent cover of grass, forb, and groundcover shrub species LIVE or having grown that season, walk around plot to estimate, actual cover not occupied area	both	Characterizes post-burn unit, vegetation response baseline
IntMort-	Percent of intermediate trees (5-12" dbh) that are RECENT dead, pre-burn data discerns mortality from causes other than fire	both	Objective 3, intermediate tree mortality
OvrMort-	Percent of (co)dominant trees (>12" dbh) that are RECENT dead, pre-burn data discerns mortality from causes other than fire	both	Objective 4, overstory mortality
Litter-	Depth (to 0.1") of undecomposed surface litter, not live herbaceous fuels	pre	Smoke and fire modeling, informs Objective 1
Duff-	Depth (to 0.1") of consolidated decomposing organic matter, not organic or mineral soil	pre	Smoke modeling, fire modeling
LegMort	Percent of legacy trees in unit estimated killed by burn, walk-through not plot-based, may need to assess again in year-2. Legacy trees are large, old (> 150 yrs) trees with complex form, wide bark plates, and provide important habitat features and aesthetic value	post	Objective 5
LDWloss	Percent loss of large diameter logs and snags (>20" diam), walk-through, not plot-based	post	Objective 7
LeaveSevr	Apparent fire severity in leave areas, reference CBI scale, walk-through, not plot-based	post	Objective 8
StrBuffer	Where applicable, percent of length of perennial streams in unit retaining unburned buffer of duff 25-50 ft wide, and retaining coarse woody material within 50 ft	post	Objective 9

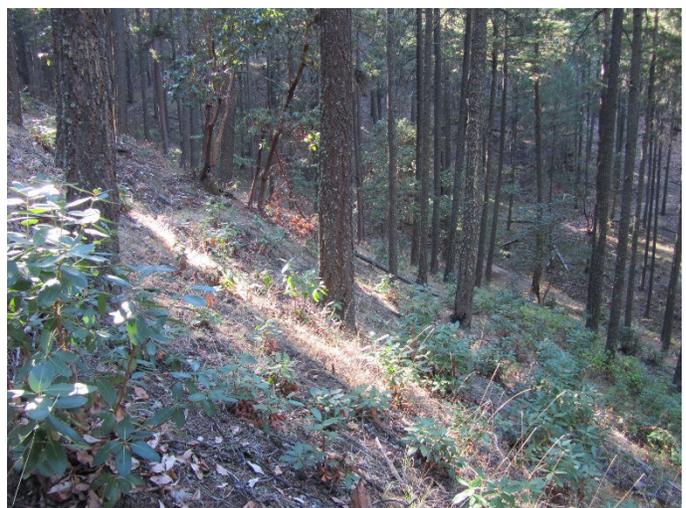


Map 1. The 26.7-acre AFR Unit 14b and the 9.4-acre AFAR Rollins property prescribed burn units accomplished in 2016 (black cross-hatch), with locations of FEMO monitoring plots (yellow). Each unit is divided into sub-areas of different fuel condition and fire effects to better interpret monitoring results and link these to fire behavior during the burn.

Representative before and after photographs from Unit 14b and the Rollins property 2016 burns



Series of before, during, and after photos from the southern portion Unit 14b showing consumption of surface fuels and understory reduction. The bottom left photo was taken immediately after the burn, bottom right in late September of the same year – note the obvious mortality of the manzanita shrub and accumulation of madrone leaf litter in the final photograph.



Lack of consumption and almost no understory reduction in the southeast portion of the Rollins unit



Moderate surface and understory fuel reduction in Unit 14b – note same season re-sprouting of the top-killed madrone sapling



Moderate surface fuel consumption and limited understory reduction in the Rollins unit – note post-burn litter accumulation



Smoke plumes during active burning on the Rollins unit at 1400 (left) and above Unit 14b at 1420 (right)