Ensenada CFRP
Field Inventory Summary
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New Mexico Forest and Watershed Restoration Institute
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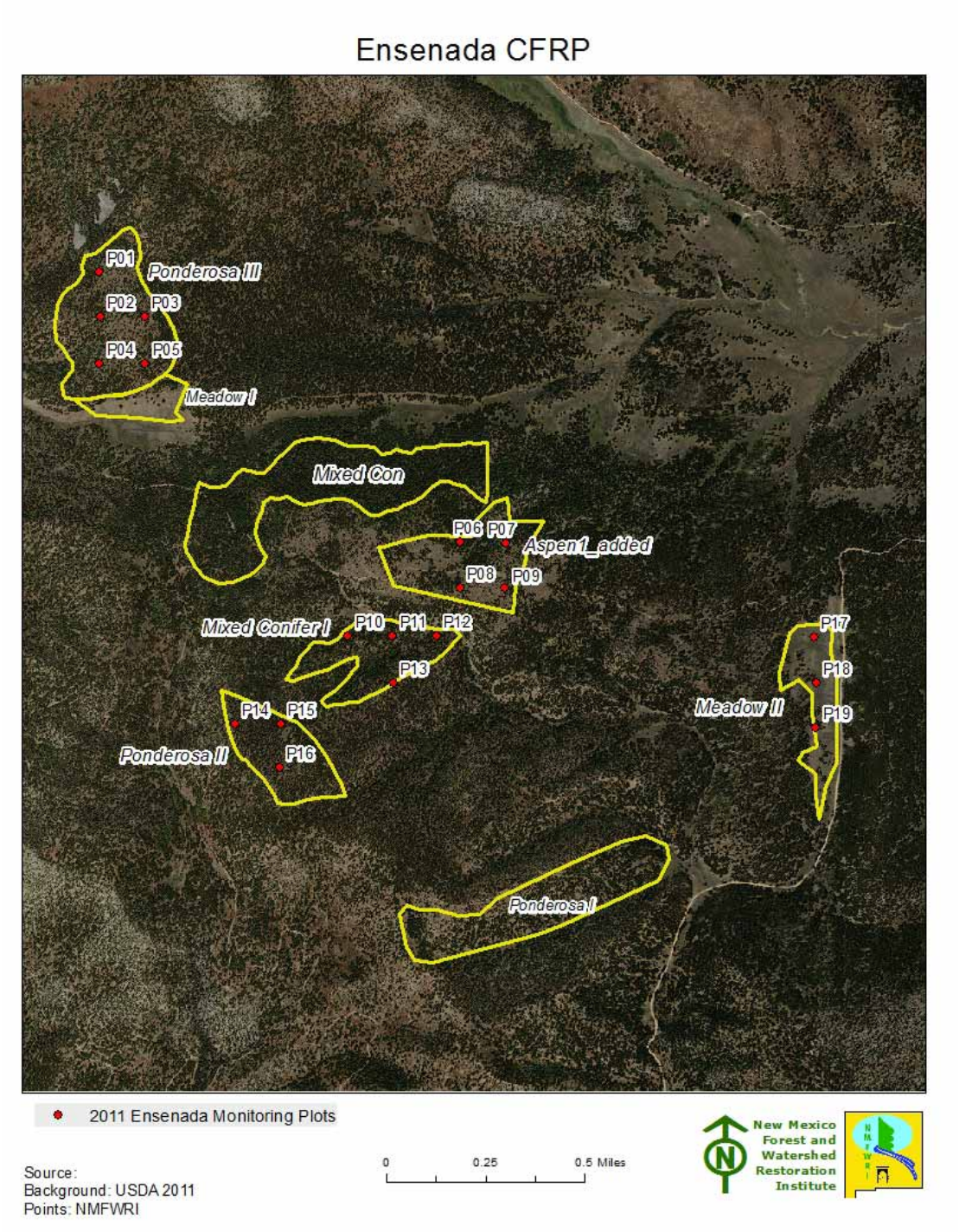


Figure 1. 2011 Monitoring Sample Plots (19 Points)

The document reports on the five-year remeasure of the CFRP project 28-05, the Ensenada Forest Health Restoration Project (Ensenada). Pre-treatment monitoring was carried out in 2005 and post-treatment monitoring in 2008 (Krasilovsky 2009). A crew from the NM Forest and Watershed Restoration Institute remeasured the project in May and June of 2011.

This project is located on the El Rito Ranger District of the Carson NF, between NM111/ FR42 and Quartzite Peak, at the northern edge of the Vallecitos Federal Sustained Yield Unit. In traditional terms, the project falls in Sections 1 and 2 of T27N R7E, and Section 35 of T28N R7E. The closest community is Tres Piedras, about 12 miles ENE of the area.

The proposal description called for treatment of 260 acres, but not that many acres were treated; we monitored five areas totaling about 154 acres. Our plots were 0.1-acre, fixed-radius, circular plots, with a nested 0.01-acre plot to estimate cover and seedling numbers, and fuels transects according to our protocols. Each plot's location was established within the treated area by our GIS specialists, loaded into a GPS unit, and the plot taken where the GPS located those coordinates.

We had transect locations from previous monitoring. However, we decided to impose our own sampling grid of 19 plots, principally because of different protocols and dissatisfaction with distribution of earlier transects within area. Coupled with the relatively low level of sampling, these differences in protocol and sampling location mean that the post-treatment measurement and the 5-year measurement are not directly comparable, although the differences are discussed in this report. Finally, this report uses *surface fuels* and *down woody debris* interchangeably.

As we currently understand fuels and fire behavior, this project area generally carries too much biomass (including down fuels) to be reasonably safe from catastrophic wildfire. This conclusion is not due to growth, but is because not enough material was removed during the project, and because the project area has not been burned. This conclusion is based on experience and judgment, but should be borne out with fire modeling. Our measurements and the restoration status of each area is discussed below.

Ponderosa II

This area is characterized by relatively short ponderosa pine with a smattering of other species (Tables 1 and 2, Figure 2). We established three plots on 30 acres. Residual basal area (BA) is still relatively high at 102 sq.ft./acre (Table 1), and the 193 total trees per acre (tpa) also is high. A bulge in the number of trees is noticeable at the 8 and 10 inch diameter at breast height (dbh) classes. Variation is high among plots (Table 4). The snag count probably doesn't meet wildlife standards, but a couple of the snags are of desired sizes.

Trees

Most (71%) of the trees on the plots were ponderosa pine (Table 2). A lot of white fir were left, especially in the small diameters. Average canopy base height was 17 feet. This area also had Gambel oak; its size is such that it was established before the treatment (Table 3). The oak biomass is expected to increase significantly as the stand ages.

Table 1. Monitoring Summary of Tree Component for Ponderosa II

Stand Total		Saplings			Pole			Tree or Sawlog											*Total by Class,Growing Stock & Dead*	*%by Class, Growing Stock vs Dead*
Diameter Class		***0***	***2***	***4***	***6***	***8***	***10***	***12***	***14***	***16***	***18***	***20***	***22***	***24***	***26***	***28***	***30***	***32***		
Growing Stock (All living trees in woodland & forestland)	**COUNT**	3	0	6	6	13	17	7	2	2	0	0	1	1	0	0	0	0	***58.00***	
	TPA	10.00	0.00	20.00	20.00	43.33	56.67	23.33	6.67	6.67	0.00	0.00	3.33	3.33	0.00	0.00	0.00	0.00	***193.33***	***85.29%***
	BA/AC	0.02	0.00	1.63	4.23	15.71	29.81	17.26	6.79	8.51	0.00	0.00	8.64	9.87	0.00	0.00	0.00	0.00	***102.47***	***86.53%***
	AVE HT, H_L	5	0	15	29.93	40	45	50	50	53	0	0	59	58	0	0	0	0		
Summary by Size Class (All living trees in woodland & forestland)	**TPA**	30.00			120.00			43.33											***193.33***	
	TPA %	15.52%			62.07%			22.41%											***100.00%***	
	BA/AC	1.65			49.76			51.06											***102.47***	
	BA/AC %	1.61%			48.56%			49.83%											***100.00%***	
	QMD MEAN DIA.	3.17			8.72			14.70											***9.86***	
	AVE HT, H_L	15			42			54											***47***	
Dead (All dead trees in woodland & forestland)	**COUNT**	0	0	3	1	3	1	0	1	0	1	0	0	0	0	0	0	0	***10.00***	
	TPA	0.00	0.00	10.00	3.33	10.00	3.33	0.00	3.33	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***33.33***	***14.71%***
	BA/AC	0.00	0.00	0.75	0.74	3.50	1.68	0.00	3.72	0.00	5.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***15.96***	***13.47%***
	AVE HT, H_L	0	0	8.369	34	34.9	33	0	55	0	56	0	0	0	0	0	0	0	***45.45068***	
Total for all sample trees including	**COUNT**	3	0	9	7	16	18	7	3	2	1	0	1	1	0	0	0	0	***68.00***	
	TPA	10.00	0.00	30.00	23.33	53.33	60.00	23.33	10.00	6.67	3.33	0.00	3.33	3.33	0.00	0.00	0.00	0.00	***226.67***	***100.00%***
	BA/AC	0.02	0.00	2.38	4.97	19.21	31.49	17.26	10.50	8.51	5.57	0.00	8.64	9.87	0.00	0.00	0.00	0.00	***118.42***	***100.00%***

Table 2. Forestland Species by Diameter Class Ponderosa II

Forestland Species		Saplings			Pole			Mature Trees											Total by Species & Covertype	%Species for all G-Stock
Diameter Class		*0*	*2*	*4*	*6*	*8*	*10*	*12*	*14*	*16*	*18*	*20*	*22*	*24*	*26*	*28*	*30*	*32*		
ABCO	COUNT	2	0	0	1	2	2	2	1	1	0	0	0	0	0	0	0	0	*11.00*	
White fir	TPA	6.67	0.00	0.00	3.33	6.67	6.67	6.67	3.33	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*36.67*	*18.97%*
	BA/AC	0.02	0.00	0.00	0.65	2.63	3.65	4.56	3.67	4.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*19.43*	*18.96%*
	AVE HT. (H_L)	5.00	0	0	6	33.73	36.95	43	48	46	0	0	0	0	0	0	0	0		
PIPO	COUNT	0	0	3	5	11	13	5	1	1	0	0	1	1	0	0	0	0	*41.00*	
Ponderosa pine	TPA	0.00	0.00	10.00	16.67	36.67	43.33	16.67	3.33	3.33	0.00	0.00	3.33	3.33	0.00	0.00	0.00	0.00	*136.67*	*70.69%*
	BA/AC	0.00	0.00	0.92	3.58	13.08	22.67	12.70	3.12	4.26	0.00	0.00	8.64	9.87	0.00	0.00	0.00	0.00	*78.83*	*76.94%*
	AVE HT. (H_L)	0	0	19.2	34.31	41.77	46.91	52.81	53	60	0	0	59	58	0	0	0	0		
PSME	COUNT	1	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	*4.00*	
Douglas-fir	TPA	3.33	0.00	3.33	0.00	0.00	6.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*13.33*	*6.90%*
	BA/AC	0.00	0.00	0.26	0.00	0.00	3.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*3.76*	*3.67%*
	AVE HT. (H_L)	5	0	14	0	0	37.64	0	0	0	0	0	0	0	0	0	0	0		
Forestland Species Sub-total	*COUNT*	*3*	*0*	*4*	*6*	*13*	*17*	*7*	*2*	*2*	*0*	*0*	*1*	*1*	*0*	*0*	*0*	*0*	*56.00*	
	TPA	*10.00*	*0.00*	*13.33*	*20.00*	*43.33*	*56.67*	*23.33*	*6.67*	*6.67*	*0.00*	*0.00*	*3.33*	*3.33*	*0.00*	*0.00*	*0.00*	*0.00*	*186.67*	*96.55%*
	BA/AC	*0.02*	*0.00*	*1.19*	*4.23*	*15.71*	*29.81*	*17.26*	*6.79*	*8.51*	*0.00*	*0.00*	*8.64*	*9.87*	*0.00*	*0.00*	*0.00*	*0.00*	*102.02*	*99.56%*
	AVE HT. (H_L)	*5*	*0*	*18*	*29.93*	*40*	*45*	*50*	*50*	*53*	*0*	*0*	*59*	*58*	*0*	*0*	*0*	*0*		
Summary by Size Class for Forestland Species	*TPA*	*23.33*			*120.00*			*43.33*											*186.67*	
	TPA %	*12.50%*			*64.29%*			*23.21%*											*100.00%*	
	BA/AC	*1.20*			*49.76*			*51.06*											*102.02*	
	BA/AC %	*1.18%*			*48.77%*			*50.05%*											*100.00%*	
	QUADRATIC MEAN DIA.	*3.07*			*8.72*			*14.70*											*10.01*	
	AVE HT. (H_L)	*18*			*42*			*54*											*48*	

Table 3. Woodland Species for Ponderosa II

Woodland Species		Saplings			Pole			Mature Trees											Total by Species	%Species for all G-Stock
QUGA Gambel oak	COUNT	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.00	
	TPA	0.00	0.00	6.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.67	3.45%
	BA/AC	0.00	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.44%
	AVE HT. (H_L)	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Woodland Species Sub-total	*COUNT*	*0*	*0*	*2*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	2.00	
	TPA	*0.00*	*0.00*	*6.67*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	6.67	3.45%
	BA/AC	*0.00*	*0.00*	*0.45*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	0.45	0.44%
	AVE HT. (H_L)	*0*	*0*	*6*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		
Summary by Size Class for Woodland Species	*TPA*	*6.67*			*0.00*			*0.00*											6.67	
	TPA %	*100.00%*			*0.00%*			*0.00%*											100.00%	
	BA/AC	*0.45*			*0.00*			*0.00*											0.45	
	BA/AC %	*100.00%*			*0.00%*			*0.00%*											100.00%	
	QUADRATIC MEAN DIA.	*3.50*			*0*			*0*											3.50	
	AVE HT. (H_L)	*6*			*0*			*0*											6	

Table 4. Individual Plot Summary Table for Ponderosa II

Macro Plot Name	Total number of sample trees on plot	Growing Stock		
		Number of growing stock sample trees on plot	Trees per Acre	Basal Area per Acre
14	26	22	220	80.19
15	26	24	240	177.31
16	16	12	120	49.90
Total			**Average for all Plots**	
			TPA	**BA/AC**
	68.00	**58.00**	**193.33**	**102.47**

Cover and Fuels

Canopy cover (48%) is good for a restored stand (Table 5), but may be a little lower than would be expected for a stand with 102 BA. Grass and forbs have still not completely recovered (about 30%), and they may be suppressed by the high litter (47%), but litter cover was 85% in 2008 (Krasilovsky 2009), so recovery is already significant. Bare soil is low at 7%.

Down woody debris (DWD) is relatively high at 16 tons per acre (Table 6). Our fuel transects also found high levels of dead woody vegetation (1.6 tons per acre). Both the components are high because of the slash still on the site (Figure 2).

Table 5. Average Percent Cover for Plot Descriptions Ponderosa II

Tree Canopy	Seedling Cover	Shrub cover	Graminoid Cover	Forb Cover	Litter	Bare Soil	Rock
47.7%	1.7%	6.7%	18.3%	13.3%	46.7%	6.7%	5.7%

Table 6. Surface Fuels Summary, fuels listed in tons per acre Ponderosa II

Surface Fuels (1,10,100,1000 hr fuels)		HD (Dead Non-Woody Veg)		HL (Live Non-Woody Veg)		SD (Dead Woody Veg)		SL (Live Woody Veg)	
Mean	SDev	Mean	SDev	Mean	Sdev	Mean	SDev	Mean	Sdev
16.3	5.3	0	0	0	0	1.6	2.8	0	0.1

Comparison with post-treatment measurement (Krasilovsky 2009)

The 2008 measurements were higher for both tpa (264 vs 193) and BA (128 vs 103) than they were in 2011.

The 2008 demographic bulge was for 10" and 12" dbh, not 8" and 10" dbh as it was in 2011.

We found no aspen in this area, vs an average of 33 aspen per acre in 2008. Conversely, we found an average of 37 white fir per acre, vs none in 2008.

Oak was not recorded in 2008.

Litter decreased and grass and forb increased since treatment, as expected.

Our 2011 work found DWD to be 16 tons/acre, vs 37 tons/acre at the first estimate in 2008. The 2009 report contains a paragraph that helps explain the difference. The El Rito Ranger District was reluctant to burn the area because of the heavy fuel loading, which led to negotiations that resulted in removal of the heavy fuels by the grantee. After that removal, loading was reduced to 13 tons/acre, which statistically is not different than what we found. The area still has not been burned.

Locations for the 2008 transects and the 2011 plots did not overlap (map not shown).

Restoration status

The area called Ponderosa II is not restored, and was not in 2008. The current BA is too high, and too many white fir are present. See the discussion below and in Krasilovsky (2009).

Ponderosa III

This area is also characterized as a ponderosa pine stand, with a few other species also present. The variability (Table 10) is possibly more than normal for stands like this, ranging from variability in density within a plot, to plots with lots of DWD and CWD (coarse woody debris, DWD over 3" in diameter) and ugly residual trees, to plots with and near small openings but with very dense groups nearby. The surface fuel comprises all sizes, and includes both old blow-down and slash from the thinning. Dwarf mistletoe on ponderosa pine is present throughout the area, as is common juniper as a shrub. Our crew established five plots on 56 acres.

The residual BA is reasonable at 84 (Table 7), but a little higher than would be expected from a recent restoration and from the high DWD (Table 12). The snag count is only in smaller diameter trees.

Trees

As with Area Ponderosa II, the white fir count of 20 tpa is higher than expected for a restored stand (Table 8). In this area, however, the diameter distribution has two peaks. One peak is larger white fir, which fits with the CFRP criterion of preserving old and large trees, although only one of the trees on plot could be called large. The other peak is very small diameter white fir, which may have been too small to be noticed by the operator when the area was thinned. Reintroduction of a natural fire regime would kill these trees and move the site closer to being restored to proper ecological function. Average canopy base height was 13 feet, which seems low. Also present was some small Gambel oak, present before the thinning, and expected to increase as the stand ages.

Cover and Fuels

Canopy cover at 44% (Table 11) seems appropriate for a restoration thin. Combined grass and forbs is about equal to litter, at about 40% each. DWD is high at 28 tons per acre (Table 12), one of the higher values we have measured, and is because of the slash. Ladder fuels levels are more normal, and appear to be from retained branches on the residual trees.

Comparison with post-treatment measurement (Krasilovsky 2009)

As mentioned above, the 2011 white fir count of 20 tpa is higher than is desirable, and matches reasonably well the 2008 count of 351 white fir per acre, 344 of them seedlings. Seedling counts were collected for this remeasure (not shown), and white fir seedlings are estimated at 52 per acre for Ponderosa III.

Canopy base height and Ground cover (i.e., litter, grass, etc.) were not reported in 2008. Surface fuels were very high both years, and the two values (20 tons per acre in 2008 vs 28 tons per acre in 2011) are probably not significantly different.

Table 7. Monitoring Summary of Tree Component for Ponderosa III

Stand Total		Saplings			Pole			Tree or Sawlog											*Total by Class,Growing Stock & Dead*	*%by Class, Growing Stock vs Dead*
Diameter Class		***0***	***2***	***4***	***6***	***8***	***10***	***12***	***14***	***16***	***18***	***20***	***22***	***24***	***26***	***28***	***30***	***32***		
Growing Stock (All living trees in woodland & forestland)	**COUNT**	5	1	4	0	5	5	4	11	3	3	0	1	0	0	0	0	0	***42.00***	
	TPA	10.00	2.00	8.00	0.00	10.00	10.00	8.00	22.00	6.00	6.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	***84.00***	***76.36%***
	BA/AC	0.02	0.09	0.62	0.00	3.75	5.31	6.72	22.65	7.87	10.02	0.00	5.67	0.00	0.00	0.00	0.00	0.00	***62.72***	***89.51%***
	AVE HT, H_L	5.89	9	14	0	36	40	50	49	47	49.9	0	47	0	0	0	0	0		
Summary by Size Class (All living trees in woodland & forestland)	**TPA**	20.00			20.00			44.00											***84.00***	
	TPA %	23.81%			23.81%			52.38%											***100.00%***	
	BA/AC	0.73			9.06			52.93											***62.72***	
	BA/AC %	1.16%			14.44%			84.39%											***100.00%***	
	QMD MEAN DIA.	2.59			9.11			14.85											***11.70***	
	AVE HT, H_L	13			39			49											***47***	
Dead (All dead trees in woodland & forestland)	**COUNT**	0	2	2	3	1	4	1	0	0	0	0	0	0	0	0	0	0	***13.00***	
	TPA	0.00	4.00	4.00	6.00	2.00	8.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***26.00***	***23.64%***
	BA/AC	0.00	0.10	0.33	0.87	0.75	3.97	1.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***7.35***	***10.49%***
	AVE HT, H_L	0.00	9.976	18.96	24.96	30	34	35	0	0	0	0	0	0	0	0	0	0	***31.65171***	
Total for all sample trees including	**COUNT**	5	3	6	3	6	9	5	11	3	3	0	1	0	0	0	0	0	***55.00***	
	TPA	10.00	6.00	12.00	6.00	12.00	18.00	10.00	22.00	6.00	6.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	***110.00***	***100.00%***
	BA/AC	0.02	0.20	0.95	0.87	4.50	9.28	8.04	22.65	7.87	10.02	0.00	5.67	0.00	0.00	0.00	0.00	0.00	***70.07***	***100.00%***

Table 8. Forestland Species by Diameter Class Ponderosa III

Forestland Species		Saplings			Pole			Mature Trees											Total by Species & Covertype	%Species for all G-Stock
Diameter Class		*0*	*2*	*4*	*6*	*8*	*10*	*12*	*14*	*16*	*18*	*20*	*22*	*24*	*26*	*28*	*30*	*32*		
ABCO	COUNT	5	0	0	0	0	1	1	2	0	0	0	1	0	0	0	0	0	***10.00***	
White fir	TPA	10.00	0.00	0.00	0.00	0.00	2.00	2.00	4.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	***20.00***	***23.81%***
	BA/AC	0.02	0.00	0.00	0.00	0.00	1.23	1.79	4.31	0.00	0.00	0.00	5.67	0.00	0.00	0.00	0.00	0.00	***13.01***	***20.74%***
	AVE HT. (H_L)	5.89	0	0	0	0	50	47	45.62	0	0	0	47	0	0	0	0	0		
PIPO	COUNT	0	1	3	0	5	3	2	7	3	2	0	0	0	0	0	0	0	***26.00***	
Ponderosa pine	TPA	0.00	2.00	6.00	0.00	10.00	6.00	4.00	14.00	6.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***52.00***	***61.90%***
	BA/AC	0.00	0.09	0.44	0.00	3.75	3.10	3.44	14.11	7.87	6.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***39.60***	***63.13%***
	AVE HT. (H_L)	0	9	14.88	0	36.26	37.90	53.94	48.45	46.73	47.4	0	0	0	0	0	0	0		
PSME	COUNT	0	0	0	0	0	1	1	2	0	1	0	0	0	0	0	0	0	***5.00***	
Douglas-fir	TPA	0.00	0.00	0.00	0.00	0.00	2.00	2.00	4.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***10.00***	***11.90%***
	BA/AC	0.00	0.00	0.00	0.00	0.00	0.98	1.49	4.22	0.00	3.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***9.93***	***15.83%***
	AVE HT. (H_L)	0	0	0	0	0	36.00	44.00	53.34	0	55.00	0	0	0	0	0	0	0		
Forestland Species Sub-total	***COUNT***	***5***	***1***	***3***	***0***	***5***	***5***	***4***	***11***	***3***	***3***	***0***	***1***	***0***	***0***	***0***	***0***	***0***	***41.00***	
	TPA	***10.00***	***2.00***	***6.00***	***0.00***	***10.00***	***10.00***	***8.00***	***22.00***	***6.00***	***6.00***	***0.00***	***2.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***82.00***	***97.62%***
	BA/AC	***0.02***	***0.09***	***0.44***	***0.00***	***3.75***	***5.31***	***6.72***	***22.65***	***7.87***	***10.02***	***0.00***	***5.67***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***62.53***	***99.71%***
	AVE HT. (H_L)	***6***	***9***	***15***	***0***	***36***	***40***	***50***	***49***	***47***	***50***	***0***	***47***	***0***	***0***	***0***	***0***	***0***		
Summary by Size Class for Forestland Species	***TPA***	***18.00***			***20.00***			***44.00***											***82.00***	
	TPA %	***21.95%***			***24.39%***			***53.66%***											***100.00%***	
	BA/AC	***0.55***			***9.06***			***52.93***											***62.53***	
	BA/AC %	***0.87%***			***14.49%***			***84.64%***											***100.00%***	
	QUADRATIC MEAN DIA.	***2.36***			***9.11***			***14.85***											***11.82***	
	AVE HT. (H_L)	***14***			***39***			***49***											***47***	

Table 9. Woodland Species by Diameter Class Ponderosa III

Woodland Species		Saplings			Pole			Mature Trees											Total by Species	%Species for all G-Stock
QUGA	COUNT	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	
Gambel oak	TPA	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.38%
	BA/AC	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.29%
	AVE HT. (H_L)	0.00	0.00	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Woodland Species Sub-total	*COUNT*	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	1.00	
	TPA	*0.00*	*0.00*	*2.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	2.00	2.38%
	BA/AC	*0.00*	*0.00*	*0.18*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	0.18	0.29%
	AVE HT. (H_L)	*0*	*0*	*13*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		
Summary by Size Class for Woodland Species	*TPA*	*2.00*			*0.00*			*0.00*											2.00	
	TPA %	*100.00%*			*0.00%*			*0.00%*											100.00%	
	BA/AC	*0.18*			*0.00*			*0.00*											0.18	
	BA/AC %	*100.00%*			*0.00%*			*0.00%*											100.00%	
	QUADRATIC MEAN DIA.	*4.10*			*0*			*0*											4.10	
	AVE HT. (H_L)	*13*			*0*			*0*											13	

Table 10. Individual Plot Summary Table for Ponderosa III

Macro Plot Name	Total number of sample trees on plot	Growing Stock		
		Number of growing stock sample trees on plot	Trees per Acre	Basal Area per Acre
1	9	8	80	94.11
2	15	10	100	47.87
3	6	6	60	4.31
4	9	9	90	53.66
5	16	9	90	113.64
Total			**Average for all Plots**	
			TPA	**BA/AC**
	55.00	**42.00**	**84.00**	**62.72**

Table 11. Average Percent Cover for Plot Descriptions Ponderosa III

Tree Canopy	Seedling Cover	Shrub cover	Graminoid Cover	Forb Cover	Litter	Bare Soil	Rock
44.4%	4.0%	5.6%	22.0%	17.0%	42.0%	10.0%	0.0%

Table 12. Surface Fuels Summary, fuels listed in tons per acre Ponderosa III

Surface Fuels (1,10,100,1000 hr fuels)		HD (Dead Non-Woody Veg)		HL (Live Non-Woody Veg)		SD (Dead Woody Veg)		SL (Live Woody Veg)	
Mean	SDev	Mean	SDev	Mean	Sdev	Mean	SDev	Mean	Sdev
27.8	17	0	0	0.1	0	0.9	1	0.9	1.2

Restoration Status

The project report (Krasilovsky 2009) contains a discussion contrasting Ponderosa II and Ponderosa III. According to the 2008 measurements, Ponderosa II had a 163 BA pre-treatment and a 128 BA post-treatment. Ponderosa III had 75 BA pre- and 52 BA post-treatment. The collaboratively developed common target was 60-80 BA. That report discussed the reality that not enough material was removed from Ponderosa II, thinning in Ponderosa III was unnecessary, and the project possibly should have concentrated on removing more from Ponderosa II.

In 2011, Ponderosa III probably can be said to have been restored, with a couple of problem items remaining. The grass production is good. Diversity exists for tree density across the area, from very dense groups to openings. The densest groups are probably still too dense, however. The biggest impediment to full restoration is the high fuel level, especially the surface fuel component. However, this condition carries its own solution: when this area is burned, much of this fuel will be consumed, the relatively low canopy base height will allow some torching, some of the denser groups will be consumed, overall tree density will decrease, and the area will fully meet most definitions of restoration.

Mixed Conifer I

Our crew took four plots on 31 acres, recording high variability among the plots (Table 15) and across the area. Some of the area looks like ponderosa pine, but a lot of New Mexico dry mixed conifer looks like ponderosa pine; our photographs look like mixed conifer (Figure 2). Some aspen is present, and some openings appear to have been deliberately cut. Both Gambel oak and common juniper are present throughout the area but did not occur on our nested sample plot. High fuel levels are visually apparent from the DWD and the retained branches on the residual trees.

Residual BA is appropriate for a restored mixed conifer stand at 78 sq.ft/acre (Table 13). This is surprising and encouraging, especially given the relatively high BA for the two ponderosa pine stands described above. Despite this encouraging dip, this BA and associated tpa (103) is at the high end of satisfactory for a restored dry mixed conifer stand. All the snags are small diameter.

Trees

The species mix shows this very definitely to be a dry mixed conifer stand (Table 14). The stand continues to have high levels of white fir, especially in the smallest diameter classes. White fir and Douglas-fir BA are not different (32 and 33 sq.ft./acre), although the number of white firs are about 40% higher. Average canopy base height was 16 feet.

Cover and Fuels

Tree canopy cover is very low (32%, Table 16) for a mixed conifer stand, but consistent with the relatively low BA. The high value (26%) for bare soil is surprising. DWD is very high at 32 tons/acre (Table 17), the second-highest level we have ever measured. The other high fuels component is the live woody vegetation (2.4 tons/acre), which is consistent with the relatively high shrub cover (7.8%, Table 16).

Table 13. Monitoring Summary of Tree Component for Mixed Conifer I

Stand Total		Saplings			Pole			Tree or Sawlog											Total by Class,Growing Stock & Dead	%by Class, Growing Stock vs Dead
Diameter Class		*0*	*2*	*4*	*6*	*8*	*10*	*12*	*14*	*16*	*18*	*20*	*22*	*24*	*26*	*28*	*30*	*32*		
Growing Stock (All living trees in woodland & forestland)	COUNT	1	10	2	3	2	1	7	6	4	2	1	1	1	0	0	0	0	*41.00*	
	TPA	2.50	25.00	5.00	7.50	5.00	2.50	17.50	15.00	10.00	5.00	2.50	2.50	2.50	0.00	0.00	0.00	0.00	*102.50*	*89.13%*
	BA/AC	0.01	0.48	0.45	1.52	1.68	1.13	12.99	16.39	13.65	9.54	5.67	6.90	7.40	0.00	0.00	0.00	0.00	*77.80*	*97.12%*
	AVE HT, H_L	6	11.95	33	39.78	38	32	50	53	58	79.9	71	75	82	0	0	0	0		
Summary by Size Class (All living trees in woodland & forestland)	TPA	32.50			15.00			55.00											*102.50*	
	TPA %	31.71%			14.63%			53.66%											*100.00%*	
	BA/AC	0.94			4.32			72.54											*77.80*	
	BA/AC %	1.21%			5.56%			93.24%											*100.00%*	
	QMD MEAN DIA.	2.30			7.27			15.55											*11.80*	
	AVE HT, H_L	22			37			64											*62*	
Dead (All dead trees in woodland & forestland)	COUNT	0	0	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	*5.00*	
	TPA	0.00	0.00	2.50	7.50	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*12.50*	*10.87%*
	BA/AC	0.00	0.00	0.25	1.14	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*2.30*	*2.88%*
	AVE HT, H_L	0	0	22	36.53	34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*33.93253*	
Total for all sample trees including	COUNT	1	10	3	6	3	1	7	6	4	2	1	1	1	0	0	0	0	*46.00*	
	TPA	2.50	25.00	7.50	15.00	7.50	2.50	17.50	15.00	10.00	5.00	2.50	2.50	2.50	0.00	0.00	0.00	0.00	*115.00*	*100.00%*
	BA/AC	0.01	0.48	0.70	2.65	2.59	1.13	12.99	16.39	13.65	9.54	5.67	6.90	7.40	0.00	0.00	0.00	0.00	*80.11*	*100.00%*

Table 14. Forestland Species by Diameter Class Mixed Conifer I (No Woodland Species)

Forestland Species		Saplings			Pole			Mature Trees											Total by Species & Covertype	%Species for all G-Stock
Diameter Class		*0*	*2*	*4*	*6*	*8*	*10*	*12*	*14*	*16*	*18*	*20*	*22*	*24*	*26*	*28*	*30*	*32*		
ABCO	COUNT	1	7	0	1	1	1	4	3	2	0	1	0	0	0	0	0	0	***21.00***	
White fir	TPA	2.50	17.50	0.00	2.50	2.50	2.50	10.00	7.50	5.00	0.00	2.50	0.00	0.00	0.00	0.00	0.00	0.00	***52.50***	***51.22%***
	BA/AC	0.01	0.42	0.00	0.46	1.01	1.13	7.70	8.33	7.00	0.00	5.67	0.00	0.00	0.00	0.00	0.00	0.00	***31.73***	***40.78%***
	AVE HT. (H_L)	6.00	12.677	0	25	33	32	45.61	52.32	51.95	0.00	71	0.00	0.00	0.00	0.00	0.00	0.00		
PIPO	COUNT	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	***1.00***	
Ponderosa pine	TPA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	0.00	0.00	0.00	***2.50***	***2.44%***
	BA/AC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.40	0.00	0.00	0.00	0.00	***7.40***	***9.51%***
	AVE HT. (H_L)	0	0	0	0	0	0	0	0	0	0	0	0	82	0	0	0	0		
PSME	COUNT	0	3	1	0	1	0	2	2	2	2	0	1	0	0	0	0	0	***14.00***	
Douglas-fir	TPA	0.00	7.50	2.50	0.00	2.50	0.00	5.00	5.00	5.00	5.00	0.00	2.50	0.00	0.00	0.00	0.00	0.00	***35.00***	***34.15%***
	BA/AC	0.00	0.06	0.13	0.00	0.67	0.00	3.64	5.43	6.65	9.54	0.00	6.90	0.00	0.00	0.00	0.00	0.00	***33.02***	***42.44%***
	AVE HT. (H_L)	0	7	10	0	45	0	52.02	47.05	64.69	79.9	0	75	0	0	0	0	0		
POTR5	COUNT	0	0	1	2	0	0	1	1	0	0	0	0	0	0	0	0	0	***5.00***	
Aspen	TPA	0.00	0.00	2.50	5.00	0.00	0.00	2.50	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***12.50***	***12.20%***
	BA/AC	0.00	0.00	0.31	1.06	0.00	0.00	1.65	2.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***5.66***	***7.27%***
	AVE HT. (H_L)	0	0	42.00	46.19	0	0	65.00	70.00	0	0	0	0	0	0	0	0	0		
Forestland Species Sub-total	***COUNT***	***1***	***10***	***2***	***3***	***2***	***1***	***7***	***6***	***4***	***2***	***1***	***1***	***1***	***0***	***0***	***0***	***0***	***41.00***	
	TPA	***2.50***	***25.00***	***5.00***	***7.50***	***5.00***	***2.50***	***17.50***	***15.00***	***10.00***	***5.00***	***2.50***	***2.50***	***2.50***	***0.00***	***0.00***	***0.00***	***0.00***	***102.50***	***100.00%***
	BA/AC	***0.01***	***0.48***	***0.45***	***1.52***	***1.68***	***1.13***	***12.99***	***16.39***	***13.65***	***9.54***	***5.67***	***6.90***	***7.40***	***0.00***	***0.00***	***0.00***	***0.00***	***77.80***	***100.00%***
	AVE HT. (H_L)	***6***	***11.945***	***33***	***39.78***	***38***	***32***	***50***	***53***	***58***	***79.9***	***71***	***75***	***82***	***0***	***0***	***0***	***0***		
Summary by Size Class for Forestland Species	***TPA***	***32.50***			***87.50***			***45.00***											***165.00***	
	TPA %	***19.70%***			***53.03%***			***27.27%***											***100.00%***	
	BA/AC	***0.85***			***36.16***			***45.75***											***82.76***	
	BA/AC %	***1.03%***			***43.69%***			***55.28%***											***100.00%***	
	QUADRATIC MEAN DIA.	***2.19***			***8.70***			***13.65***											***9.59***	
	AVE HT. (H_L)	***17***			***37***			***49***											***44***	

Table 15. Individual Plot Summary Table for Mixed Conifer I

Macro Plot Name	Total number of sample trees on plot	Growing Stock		
		Number of growing stock sample trees on plot	Trees per Acre	Basal Area per Acre
10	14	14	140	74.18
11	6	6	60	35.47
12	13	10	100	86.22
13	13	11	110	115.35
Total			**Average for all Plots**	
			TPA	**BA/AC**
	46.00	**41.00**	**102.50**	**77.80**

Table 16. Average Percent Cover for Plot Descriptions Mixed Conifer I

Tree Canopy	Seedling Cover	Shrub cover	Graminoid Cover	Forb Cover	Litter	Bare Soil	Rock
32.5%	1.8%	7.8%	15.0%	13.8%	33.8%	26.3%	2.5%

Table 17. Surface Fuels Summary, fuels listed in tons per acre Mixed Conifer I

Surface Fuels (1,10,100,1000 hr fuels)		HD (Dead Non-Woody Veg)		HL (Live Non-Woody Veg)		SD (Dead Woody Veg)		SL (Live Woody Veg)	
Mean	SDev	Mean	SDev	Mean	Sdev	Mean	SDev	Mean	Sdev
32.1	4.4	0	0	0.1	0.1	0.1	0.2	2.4	2.7

Comparison with post-treatment measurement (Krasilovsky 2009)
Post-treatment BA was not reported in 2008, but total stems per acre (all standing stems >4.5' tall, including snags) were 252 in 2008 and 115 in 2011. Since our results were the most departed from values derived from earlier monitoring for this area, Table 18 is presented to enable comparisons. Note that relative numbers of trees for each species are very similar before treatment and at the 5-year remeasure.

Table 18. Mixed Conifer I live trees per acre

species	pre-treatment	post-treatment	5-yr remeasure	notes
White fir	142	45	52	possibly ingrowth
Douglas-fir	114	68	35	
Aspen	58	55	13	
Ponderosa pine	24	16	3	

Canopy base height decreased from 22 feet in 2008 to 16 in 2011, and canopy cover also is less than in 2008, 45% vs 32%.
Ground cover (i.e., litter, grass, etc.) was not reported in 2008.
Surface fuels were very high both years (24 tons/acre in 2008, 32 tons/acre in 2011), and variation was low enough in 2011 (std.dev. = 4.4) that the two values may be statistically different.

Restored status
The presence of aspen is welcome, but also presents challenges. Established aspen clones are subject to being invaded and overtopped by shade-tolerant conifers. That may be happening here. Although some openings appear to have been deliberately cut in the existing stand, and contribute to the diversity that is an important part of restoration, they are in the wrong place or not large enough to rejuvenate the aspen. The small size of some of the aspen is encouraging – plot 12 had the equivalent of 190 aspen sprouts per acre - and probably indicates a healthy root system for that clone. Finally, reintroducing a natural fire regime into this stand will be at odds with maintaining this socially desired advanced growth.

High fuel loads alone are reason enough to reject this area as restored, but as with Ponderosa III, properly burning the stand should accomplish the restoration. At this fuel load and canopy base height, or even the 2008 canopy base height of 22 feet, torching in the residual stand is expected, leading to additional thinning of the stand, especially reducing the small white fir. If the fuel were burned and all the small trees miraculously escaped death, too many small Douglas- and white fir are present to consider the area restored.

Aspen I

This project's report (Krasilovsky 2009) states that the objective here was not fire reduction, but to "increase the extent of aspen" on the District; treatment was focused on removing white fir from within the aspen clones. For our crew in 2011, however, Aspen I appears to be just a name,

since we had aspen in the vicinity of our plots only once (Plot 8), measured only one plot with an aspen on it (Table 20), and that one aspen was small. The growing stock BA of 83 sq.ft./acre (Table 19) would be about right for restored mixed conifer, but the residual stand is mostly ponderosa pine (Table 20). Some of the ponderosa pine groups are very dense (Figure 2, background), and all the snags are small (Table 19). Common juniper is found through this area. On the positive side, some decent-sized openings were cut during the thinning operation (photos on file). We also found the normal range of high variability for the indicators we measured (Table 21). We took four plots on 15 acres.

Trees

The summary data for the standing trees in this area (Table 20) closely resemble area Ponderosa III: the white fir diameter distribution has two peaks; several larger trees were left, although they are not large; very small trees are present, which may have been too small to be noticed when the area was thinned; and reintroduction of a natural fire regime is needed. Unlike Ponderosa III, we recorded no Douglas-fir, but did find one aspen. Average canopy base height was 18 feet.

Cover and Fuels

Canopy cover (45%) is appropriate for the BA (83, Table 20). The combined grass and forb cover of 41% is a little surprising given the canopy cover, the relatively heavy litter (47%) in 2011, and the very heavy litter cover (93%) immediately post-treatment (Krasilovsky 2009). DWD was moderate (5.5 tons/acre), and other fuels were very low. This lack of slash is surprising, and distinguishes it from the other project areas. From field observation, the boles of the trees were removed and the slash piled during the thinning, and our fuel transects never intercepted a pile.

Table 19. Monitoring Summary of Tree Component for Aspen I

Stand Total		Saplings			Pole			Tree or Sawlog											*Total by Class,Growing Stock & Dead*	*%by Class, Growing Stock vs Dead*
Diameter Class		*0*	*2*	*4*	*6*	*8*	*10*	*12*	*14*	*16*	*18*	*20*	*22*	*24*	*26*	*28*	*30*	*32*		
Growing Stock (All living trees in woodland & forestland)	**COUNT**	5	6	2	5	15	15	8	6	3	1	0	0	0	0	0	0	0	***66.00***	
	TPA	12.50	15.00	5.00	12.50	37.50	37.50	20.00	15.00	7.50	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***165.00***	***92.96%***
	BA/AC	0.02	0.42	0.41	2.73	13.69	19.74	15.22	15.91	10.15	4.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***82.76***	***97.58%***
	AVE HT, H_L	5.77	15.31	20	36.66	35	39	47	50	49	58	0	0	0	0	0	0	0		
Summary by Size Class (All living trees in woodland & forestland)	**TPA**	32.50			87.50			45.00											***165.00***	
	TPA %	19.70%			53.03%			27.27%											***100.00%***	
	BA/AC	0.85			36.16			45.75											***82.76***	
	BA/AC %	1.03%			43.69%			55.28%											***100.00%***	
	QMD MEAN DIA.	2.19			8.70			13.65											***9.59***	
	AVE HT, H_L	17			37			49											***44***	
Dead (All dead trees in woodland & forestland)	**COUNT**	0	2	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	***5.00***	
	TPA	0.00	5.00	0.00	2.50	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***12.50***	***7.04%***
	BA/AC	0.00	0.05	0.00	0.49	1.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***2.05***	***2.42%***
	AVE HT, H_L	0	8.074	0	22	31.4	0	0	0	0	0	0	0	0	0	0	0	0	***28.61871***	
Total for all sample trees including	**COUNT**	5	8	2	6	17	15	8	6	3	1	0	0	0	0	0	0	0	***71.00***	
	TPA	12.50	20.00	5.00	15.00	42.50	37.50	20.00	15.00	7.50	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***177.50***	***100.00%***
	BA/AC	0.02	0.47	0.41	3.22	15.20	19.74	15.22	15.91	10.15	4.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***84.81***	***100.00%***

Table 20. Forestland Species by Diameter Class Ponderosa II (No Woodland Species)

Forestland Species		Saplings			Pole			Mature Trees											Total by Species & Covertype	%Species for all G-Stock
Diameter Class		*0*	*2*	*4*	*6*	*8*	*10*	*12*	*14*	*16*	*18*	*20*	*22*	*24*	*26*	*28*	*30*	*32*		
ABCO	COUNT	5	3	0	1	2	5	0	1	1	0	0	0	0	0	0	0	0	***18.00***	
White fir	TPA	12.50	7.50	0.00	2.50	5.00	12.50	0.00	2.50	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***45.00***	***27.27%***
	BA/AC	0.02	0.23	0.00	0.43	1.82	6.57	0.00	2.79	3.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***15.65***	***18.92%***
	AVE HT. (H_L)	5.77	13.101	0	22	33.97	39.2	0	47	43	0	0	0	0	0	0	0	0		
PIPO	COUNT	0	3	2	3	13	10	8	5	2	1	0	0	0	0	0	0	0	***47.00***	
Ponderosa pine	TPA	0.00	7.50	5.00	7.50	32.50	25.00	20.00	12.50	5.00	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***117.50***	***71.21%***
	BA/AC	0.00	0.19	0.41	1.71	11.87	13.18	15.22	13.12	6.34	4.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***66.51***	***80.37%***
	AVE HT. (H_L)	0	17.91	20.03	41.25	35.58	38.17	47.19	50.31	51.87	58	0	0	0	0	0	0	0		
POTR5	COUNT	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	***1.00***	
Aspen	TPA	0.00	0.00	0.00	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***2.50***	***1.52%***
	BA/AC	0.00	0.00	0.00	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***0.59***	***0.72%***
	AVE HT. (H_L)	0	0	0	34.00	0	0	0	0	0	0	0	0	0	0	0	0	0		
Forestland Species Sub-total	***COUNT***	***5***	***6***	***2***	***5***	***15***	***15***	***8***	***6***	***3***	***1***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***66.00***	
	TPA	***12.50***	***15.00***	***5.00***	***12.50***	***37.50***	***37.50***	***20.00***	***15.00***	***7.50***	***2.50***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***165.00***	***100.00%***
	BA/AC	***0.02***	***0.42***	***0.41***	***2.73***	***13.69***	***19.74***	***15.22***	***15.91***	***10.15***	***4.47***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***82.76***	***100.00%***
	AVE HT. (H_L)	***6***	***15.31***	***20***	***36.66***	***35***	***39***	***47***	***50***	***49***	***58***	***0***	***0***	***0***	***0***	***0***	***0***	***0***		
Summary by Size Class for Forestland Species	***TPA***	***32.50***			***87.50***			***45.00***											***165.00***	
	TPA %	***19.70%***			***53.03%***			***27.27%***											***100.00%***	
	BA/AC	***0.85***			***36.16***			***45.75***											***82.76***	
	BA/AC %	***1.03%***			***43.69%***			***55.28%***											***100.00%***	
	QUADRATIC MEAN DIA.	***2.19***			***8.70***			***13.65***											***9.59***	
	AVE HT. (H_L)	***17***			***37***			***49***											***44***	

Table 21. Individual Plot Summary Table for Aspen I

Macro Plot Name	Total number of sample trees on plot	Growing Stock		
		Number of growing stock sample trees on plot	Trees per Acre	Basal Area per Acre
6	14	14	140	91.16
7	31	26	260	95.43
8	22	22	220	102.23
9	4	4	40	42.21
Total			**Average for all Plots**	
			TPA	**BA/AC**
	71.00	**66.00**	**165.00**	**82.76**

Table 22. Average Percent Cover for Plot Descriptions Aspen I

Tree Canopy	Seedling Cover	Shrub cover	Graminoid Cover	Forb Cover	Litter	Bare Soil	Rock
45.0%	0.8%	2.8%	26.3%	15.0%	47.5%	7.5%	1.3%

Table 23. Surface Fuels Summary, fuels listed in tons per acre Aspen I

Surface Fuels (1,10,100,1000 hr fuels)		HD (Dead Non-Woody Veg)		HL (Live Non-Woody Veg)		SD (Dead Woody Veg)		SL (Live Woody Veg)	
Mean	SDev	Mean	SDev	Mean	Sdev	Mean	SDev	Mean	Sdev
5.5	4.2	0	0	0.1	0.1	0	0	0	0

Comparison with post-treatment measurements (Krasilovsky 2009)
Aspen tpa were 89 in 2008 and one in 2011. Our plot locations did not overlap with the 2008 transects.
Ponderosa pine tpa were 85, or 43% of growing stock, in 2008, and 117 tpa, or 71%, in 2011.
Height to base of crown, Canopy cover, and Surface fuels were not reported in 2008.
Basal area was not different from 2008, and it is also not different from 2005 pre-treatment measurements; BA was 84 in 2005, 84 in 2008, and 83 in 2011. Even given no plot/transect overlap, different protocols, and a possible light thinning, this circumstance is extraordinary.
Litter decreased and grass and forbs increased since treatment, as expected.

Restoration status
This project's pre-implementation summary on the CFRP website says "the project includes an aspen regeneration patch cut." This prescription seems to have been changed during implementation, since the project report (Krasilovsky 2009) says "the goal of the treatment was to increase the extent of aspen on the El Rito District." According to Schier, Shepperd, and Jones (1985), because of the strong apical dominance exerted by the trees, rejuvenation of an aspen clone is best when all the larger aspen growing from the root network are cut. Cutting the invading conifers out of the aspen clones as was done here is desirable – the Institute promotes it as a weekend recreational activity – but its principle benefits are to reduce fire severity and to delay the decadence of the clone. It can not increase the extent of the clone, and it does not appreciably increase sprouting of the clone's root system. The Chama District of NM State Forestry has had good success with rejuvenation of aspen clones, and they should be consulted by readers who wish to see examples of their success.

The aspen aside, we can consider if the area has been restored from the standpoint of the ponderosa pine. One oddity is the unchanged BA since the initial pre-treatment monitoring; experience and logic say that the BA has to be less than the original state, no matter how little it has changed. The residual pine is very variable, with some appropriate openings, and some very dense groups. Many pines are in the pole size, and this area will quickly get too dense. Of all the areas, this one had the lowest measured fuel levels, and it can and should be burned immediately to keep it where it is, in an acceptable condition. From a ponderosa pine standpoint, this area is restored, but barely.

Meadow II

This project area appears to have been restoration of a meadow that had been encroached upon by conifers (Figure 2). Our crew took three plots on 22 acres, and only one plot had standing trees (Table 26). Average canopy base height on that one plot was 18 feet.

Trees
Only ponderosa pine was on the plot, and all of them were living; because of this, Tables 24 and Table 25 are essentially the same. One indication that this was an historic meadow is the lack of snags (Table 24). The one plot with trees had a BA of 84 (Table 25).

Cover and Fuels
Canopy cover (22%, Table 27) is as would be expected for a meadow surrounded by forest. Combined grass and forbs cover was high (65%), but litter was also high for a meadow at 25%.

Surface fuel was high for a meadow at 9.5 tons/acre (Table 28), reflecting the slash left as part of the restoration. Other fuel components were very low, as would be expected.

Table 24. Monitoring Summary of Tree Component for Meadow II

Stand Total		Saplings			Pole			Tree or Sawlog											Total by Class,Growing Stock & Dead	% by Class, Growing Stock vs Dead
Diameter Class		*0*	*2*	*4*	*6*	*8*	*10*	*12*	*14*	*16*	*18*	*20*	*22*	*24*	*26*	*28*	*30*	*32*		
Growing Stock (All living trees in woodland & forestland)	**COUNT**	0	0	0	0	0	0	1	4	1	1	0	0	0	0	0	0	0	***7.00***	
	TPA	0.00	0.00	0.00	0.00	0.00	0.00	3.33	13.33	3.33	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***23.33***	***100.00%***
	BA/AC	0.00	0.00	0.00	0.00	0.00	0.00	2.66	15.15	4.71	5.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***27.90***	***100.00%***
	AVE HT, H_L	0	0	0	0	0	0	48	44	48	50	0	0	0	0	0	0	0		
Summary by Size Class (All living trees in woodland & forestland)	**TPA**	0.00			0.00			23.33											***23.33***	
	TPA %	0.00%			0.00%			100.00%											***100.00%***	
	BA/AC	0.00			0.00			27.90											***27.90***	
	BA/AC %	0.00%			0.00%			100.00%											***100.00%***	
	QMD MEAN DIA.	0.00			0.00			14.81											***14.81***	
	AVE HT, H_L	0			0			46											***46***	
Dead (All dead trees in woodland & forestland)	**COUNT**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	***0.00***	
	TPA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***0.00***	***0.00%***
	BA/AC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***0.00***	***0.00%***
	AVE HT, H_L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	***0***	
Total for all sample trees including	**COUNT**	0	0	0	0	0	0	1	4	1	1	0	0	0	0	0	0	0	***7.00***	
	TPA	0.00	0.00	0.00	0.00	0.00	0.00	3.33	13.33	3.33	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***23.33***	***100.00%***
	BA/AC	0.00	0.00	0.00	0.00	0.00	0.00	2.66	15.15	4.71	5.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***27.90***	***100.00%***

Table 25. Forestland Species by Diameter Class Meadow II (No Woodland Species)

Forestland Species		Saplings			Pole			Mature Trees											Total by Species & Covertype	%Species for all G-Stock
Diameter Class		*0*	*2*	*4*	*6*	*8*	*10*	*12*	*14*	*16*	*18*	*20*	*22*	*24*	*26*	*28*	*30*	*32*		
PIPO	COUNT	0	0	0	0	0	0	1	4	1	1	0	0	0	0	0	0	0	*7.00*	
Ponderosa pine	TPA	0.00	0.00	0.00	0.00	0.00	0.00	3.33	13.33	3.33	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*23.33*	*100.00%*
	BA/AC	0.00	0.00	0.00	0.00	0.00	0.00	2.66	15.15	4.71	5.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*27.90*	*100.00%*
	AVE HT. (H_L)	0	0	0	0	0	0	48	43.9	48	50	0	0	0	0	0	0	0		
Forestland Species Sub-total	***COUNT***	***0***	***0***	***0***	***0***	***0***	***0***	***1***	***4***	***1***	***1***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	*7.00*	
	TPA	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***3.33***	***13.33***	***3.33***	***3.33***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	*23.33*	*100.00%*
	BA/AC	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***2.66***	***15.15***	***4.71***	***5.38***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	*27.90*	*100.00%*
	AVE HT. (H_L)	***0***	***0***	***0***	***0***	***0***	***0***	***48***	***44***	***48***	***50***	***0***	***0***	***0***	***0***	***0***	***0***	***0***		
Summary by Size Class for Forestland Species	***TPA***		*0.00*			*0.00*						*23.33*							*23.33*	
	TPA %		*0.00*			*0*						*100.00%*							*100.00%*	
	BA/AC		*0.00*			*0.00*						*27.90*							*27.90*	
	BA/AC %		*0.00*			*0*						*100.00%*							*100.00%*	
	QUADRATIC MEAN DIA.		*0.00*			*0*						*14.81*							*14.81*	
	AVE HT. (H_L)		*0.00*			*0*						*46*							*46*	

Table 26. Individual Plot Summary Table for Meadow II

Macro Plot Name	Total number of sample trees on plot	Growing Stock		
		Number of growing stock sample trees on plot	Trees per Acre	Basal Area per Acre
17	0	0	0	0.00
18	0	0	0	0.00
19	7	7	70	83.71
Total			**Average for all Plots**	
			TPA	**BA/AC**
	7.00	**7.00**	**23.33**	**27.90**

Table 27. Average Percent Cover for Plot Descriptions Meadow II

Tree Canopy	Seedling Cover	Shrub cover	Graminoid Cover	Forb Cover	Litter	Bare Soil	Rock
22.0%	0.3%	0.0%	56.7%	8.3%	25.0%	13.3%	0.0%

Table 28. Surface Fuels Summary, fuels listed in tons per acre Meadow II

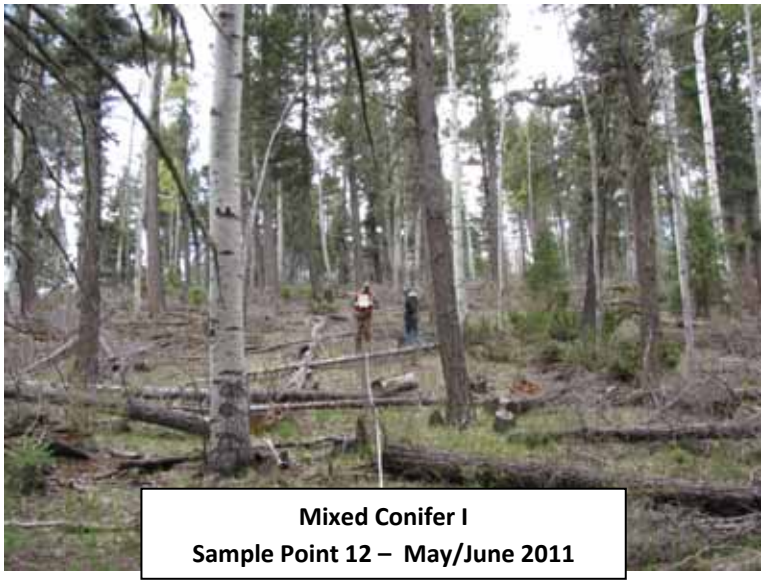
Surface Fuels (1,10,100,1000 hr fuels)		HD (Dead Non-Woody Veg)		HL (Live Non-Woody Veg)		SD (Dead Woody Veg)		SL (Live Woody Veg)	
Mean	SDev	Mean	SDev	Mean	Sdev	Mean	SDev	Mean	Sdev
9.5	4.6	0	0	0.3	0.1	0	0	0	0

Comparison with post-treatment measurements (Krasilovsky 2009)
High numbers of 0-5" dbh trees were present immediately post-treatment, compared to none now. Counts in 2008 were 58 seedlings and 39 poles per acre. We did find some small trees in 2011, but only a few individuals could have been poles in 2008.
Litter decreased and grass and forb increased since treatment, as expected.
Fuel loading decreased, although why is a mystery, since no mechanism (burning or firewood collection) was present since the treatment.

Restoration status
The meadow is restored to this area. Even though the one plot had a high BA, to have removed all the trees from two of the three plots is satisfactory.

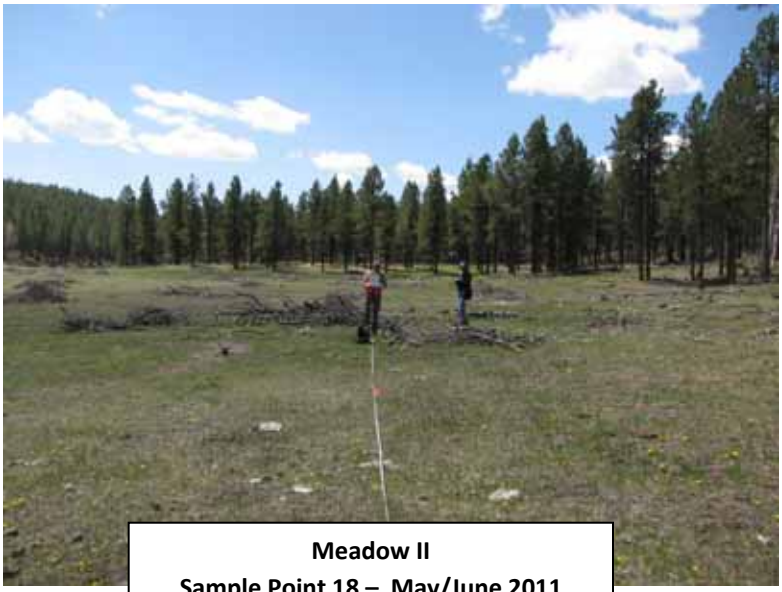
Ponderosa III
Sample Point 1 – May/June 2011

Aspen I
Sample Point 6 – May/June 2011

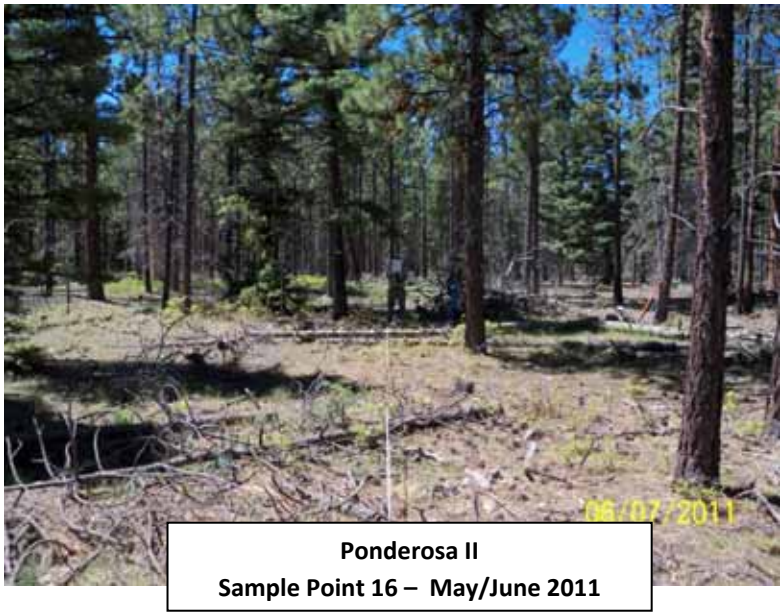


Mixed Conifer I
Sample Point 12 – May/June 2011

Mixed Conifer I
Sample Point 13 – May/June 2011



Meadow II
Sample Point 18 – May/June 2011



Ponderosa II
Sample Point 16 – May/June 2011

Figure 2. Ensenada 5-year Sample Point Photographs, all taken one chain north of plot center

Final Observations

The principle worry with the Ensenada project five years post-treatment is not with the deterioration of the restoration indicators since the project ended, but with how little was cut during the project, and how much of the area is still too dense. Surface fuels are too high on three of the five areas, but not higher than what we have seen burned successfully at other locations in northern NM. On the other two areas, fuel levels are not high but are sufficient to carry a prescribed fire. All of the areas are thinned to the point that a properly executed prescribed fire would not significantly damage the residual stand. A golden opportunity exists here to get fire back on the ground, restore full ecological function, and not lose the significant monetary investment in mechanical thinning.

Another concern is with our monitoring. The assumption has always been that we will be able to capture trends with the intensity and protocols we use, but some of these observations throw that assumption into doubt. We will continue to compare our measurements with those of the project grantees to see if protocols need to be adjusted.

On the other hand, restoration should increase variability in a stand and on the landscape. By the criterion of high variability, the Ensenada project appears to be successful.

Bibliography

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Schier, G.A., W.D. Shepperd, and J.R. Jones. 1985. Regeneration, pp 197-208, *in* N.V. DeByle and R.P. Winokur, Eds, Aspen: Ecology and Management in the Western United States, GTR-RM-119, USDA Forest Service, RMRS, Fort Collins, CO

Table 29. Latitude and Longitude for Ensenada Sample Plots

Name	Area	Longitude	Latitude	Elevation (feet)
P01	Ponderosa III	-106.1688787	36.61866619	9043
P02	Ponderosa III	-106.1688538	36.61701787	9056
P03	Ponderosa III	-106.1668091	36.61703791	9026
P04	Ponderosa III	-106.1688289	36.61536955	9002
P05	Ponderosa III	-106.1667842	36.61538959	9012
P06	Aspen I	-106.1523731	36.60893556	9077
P07	Aspen I	-106.1503286	36.60895532	9041
P08	Aspen I	-106.1523486	36.60728723	9074
P09	Aspen I	-106.1503041	36.60730698	9050
P10	Mixed Conifer I	-106.1574522	36.60547342	9108
P11	Mixed Conifer I	-106.1554077	36.60549327	9075
P12	Mixed Conifer I	-106.1533632	36.60551307	9018
P13	Mixed Conifer I	-106.1553831	36.60384493	9090
P14	Ponderosa II	-106.1624969	36.60224295	9214
P15	Ponderosa II	-106.1604525	36.60226287	9251
P16	Ponderosa II	-106.1604278	36.60061454	9195
P17	Meadow II	-106.1361779	36.60565615	8774
P18	Meadow II	-106.1361537	36.60400781	8765
P19	Meadow II	-106.1361295	36.60235947	8764

Figure 3. Roadside sign on the Ensenada project