Thunderbird Monitoring Report
CFRP Grant #02-05
September 6, 2008

Executive Summary

This monitoring report summarizes data from a CFRP grant to P&M signs (Grant #02-05) for treatment in the Thunderbird area of the Cibola National Forest, Mountainair Ranger District. Monitoring data were collected by area youth, with oversight from a youth monitoring coordinator, Claunch-Pinto Soil and Water Conservation District, and the CFRP Monitoring Technical Assistance Team. Monitoring data were collected in 2006, prior to any treatment. Data were again collected in 2007 and 2008. Of 5 units planned for treatment, one unit and part of a second unit were treated in the summer and fall of 2007. In the fall of 2007, the Ojo Peak fire burned through most of the project area. As a result, overall monitoring data reflect site conditions from 2006 to 2008 more than the ecological impacts of the project itself. A pre-post treatment comparison for Unit 25 is provided to represent actual project impacts. Eight youth and one adult were employed for 500-650 hours each year for data collection in 2007 and 2008. The youth received 58 hours of training in 2007, and 14 hours of training in 2008.

Data were collected following CFRP Monitoring Protocols for tree density, species and size; sapling and seedling density; canopy cover; understory cover; and surface fuel load. In general, there was no reduction in the density of trees, as trees, live or dead, remained standing in the summer of 2008 following the fire. However, there was a decrease in the number of saplings and seedlings per acre. Saplings were reduced by 178% and seedlings by 54%. The understory was predominantly litter, both pre- and post-treatment/fire. Grasses and forbs were sparse at the site, both pre- and post-treatment, with a decline in each cover category, primarily due to fire effects. For all sites combined, canopy cover decreased by 47%. Overall, surface fuels decreased by 57%, largely due to the fire.

In Unit 25, which was treated and unaffected by the fire, density was reduced from 117 to 40 trees per acre, with the average size of trees increasing from 7.9 to 13.5. Saplings were reduced by 84% and seedlings were reduced by 80%. Size class distributions changed as expected, with a reduction in the number of trees in the smaller size classes, and the larger size classes remaining. The average tree size increased by 71%. Canopy cover decreased by 383%. Surface fuel loads increased by 42%. There was more than 100% reduction in both grasses and forbs in the understory. These reductions are likely treatment effects, since precipitation was higher in the post-treatment years than the pre-treatment year. Some invasive thistle was found on the site in 2008 and should be monitored and controlled.

Introduction

As part of a CFRP grant to P&M signs (Grant # 02-05), a multiparty monitoring plan was collaboratively developed by the Claunch-Pinto Soil and Water Conservation District, CFRP Monitoring Technical Assistance Team, Forest Service, and Youth coordinator Anna Marie Nuñez, to evaluate the ecological impact of thinning treatments in the Thunderbird area of the Mountainair Ranger District of the Cibola National Forest. This report summarizes data collected in 2006, 2007 and 2008 for the project area. In November 2007, much of the project area was burned in the Ojo Peak fire before treatment was completed. Of the 5 units in the project area, 4 were burned. Data were collected in 2008 in all project areas, with a mosaic of post-treatment and post-fire effects.

Socioeconomic Impact

Eight youth were hired and trained in the summer of 2008. Both the Youth Coordinator and Youth Monitoring Team were trained in the field by the CFRP Monitoring Technical Assistance Team. Most of these youth also received training in 2006 and 2007. Table 1 summarizes youth training and employment hours for 2007 and 2008.

Table 1. Youth Employment and Training

	Number of Youth	Hours employed	Hours trained
2007	8, plus 1 adult coordinator	650 (all youth)	58
2008	8, plus 1 adult coordinator	512 (all youth)	14

In addition to collecting and analyzing data, youth learned how monitoring data can aid in adaptive management by influencing project prescriptions and treatments. For some youth, this was a first job, so they also learned basic skills related to employment, such as filling out timesheets and responsible work behaviors.

Ecological Monitoring Methodology

All monitoring indicators and methods were developed using guidance from the CFRP Monitoring Technical Assistance Team and *Handbook 4: Monitoring Ecological Effects of CFRP projects* (available on-line at http://www.fs.fed.us/r3/spf/cfrp/monitoring/). The following indicators were monitored at each site:

- Adult tree size and density
- Density of Saplings and Seedlings
- Understory Cover
- Canopy Cover
- Surface Fuels, and
- Photo points

Sampling

Pre-treatment data were collected in Units 25, 2 and 3 in the summer of 2006. Additional pre-treatment data were collected in Units 4 and 5 during the summer of 2007, making for a total of 5 monitoring sites. Post-treatment data were collected for Unit 25 in the summer of 2007. Data were collected in all 5 units, with a mosaic of post-treatment or post-fire effects, as follows:

- Unit 25: Treated in 2007. Post treatment data collected in 2007 and 2008
- Unit 2: Partially treated prior to Ojo Peak fire. Post-treatment/post-fire data collected in 2008
- Units 3, 4 and 5: Untreated; burned in Ojo Peak fire. Post-fire data collected in 2008

Monitoring data were collected along 300-foot transects, with plots and shorter transects located along these transects. The number of transects varied by the size of each unit. Two transects were established on Unit 25; 4 transects on Unit 2; and 6 transects each on units 3, 4 and 5. A total of 24 transects were installed at the combined 5 monitoring sites. All transects were marked with rebar and flagging and the GPS positions were recorded. Transects were re-established on all units impacted by the fire.

Methods

More detail on each of the monitoring methods described below can be found in *Handbook 4: Monitoring Ecological Effects of CFRP projects* (available on-line at http://www.fs.fed.us/r3/spf/cfrp/monitoring/).

1. *Adult tree size* was measured in 30 x 30 foot plots, every 50 feet along a 300-foot transect. The Diameter at Breast Height (DBH) of each adult tree was measured in inches and the species of each tree recorded.
2. *Density of Saplings and Seedlings* were recorded by species in the same 30 x 30 foot plots as adult trees. Saplings and seedlings were counted as tallies for each species.
3. *Understory Cover* was measured in 3 x 3 foot plots every 20 feet along the 300-foot transect. The percent of understory cover was estimated in ranges for each of the following categories: grasses, forbs, soil/bare rock, and litter.
4. *Canopy Cover* was measured every 10 feet along the first 100-feet of the 300-foot transect using a sighting tube made of PVC pipe that was divided into quadrants. If the canopy cover filled more than 50% of a quadrant, it was given a value of 1. Areas with no canopy cover would receive a score of 0, while areas with nearly 100% canopy cover would receive a score of 4.
5. *Surface Fuels* were measured using the Brown's lines methodology. With this method, 30-foot transects are set up at the beginning and end of each 30-foot transect:
    - Fuels less than 0.25 inches were measured along the first 6 feet of the transect;
    - Fuels between 0.25-0.99 inches in diameter were measured along the first 6 feet of the transect;
    - Fuels between 1.0-2.99 inches were measured along the first 10 feet of the transect, and
    - Fuels greater than 3.0 inches were measured along the full 30-feet of transect and their diameters are recorded.
6. *Photo Points* were established at the beginning and end of each transect. Photographs were taken in each of the cardinal directions using a digital camera.

Data Management

All data were recorded on data sheets in the field and stored in binders for each unit. Photos were printed and also stored in data binders for each unit. In addition, all data were entered into excel spreadsheets. Copies of each data sheet and all electronic files are stored with Claunch Pinto Soil and Water Conservation District and with the Youth Coordinator at Mountainair High School. Data were verified by summary analyses and visual inspection.

Data Analysis

All adult trees, sapling, and seedling data were converted to a per acre number. Data were then organized into size class charts and species frequency charts. Understory cover was converted to the mid-point of each range value. Canopy cover was converted to percent totals. Surface Fuels were converted using the Brown's lines equations. All data analysis methods can be found in *Handbook 4: Monitoring Ecological Effects of CFRP projects* (available on-line at http://www.fs.fed.us/r3/spf/cfrp/monitoring/).

Because of the unique circumstances of this project having a wildfire burn much of the project area, data are analyzed and presented in 3 ways:

- Pre and Post treatment data are presented for all units combined, which gives a representation of the project area at two points in time, though with a mixture of treated, untreated, and burned areas. Though the ecological changes measured are not all due to the project's implementation (and most are due to fire), this information is important for future land management and long-term monitoring of these sites.
- Pre and Post treatment data are presented separately only for Unit 25. Unit 25 is the only unit that was treated and unaffected by the fire.

Ecological Monitoring Results

Overall Tree Data

Table 2 summarizes adult tree, sapling, and seedling densities in 2006/2007 and 2008. Because transects were relocated in most units, differences in tree density and size reflect sample error. In general, there was no reduction in the density of trees, as trees, live or dead, remained standing in the summer of 2008 following the fire. However, there was a decrease in the number of saplings and seedlings per acre. Saplings were reduced by 178% and seedlings by 54%.

Table 2. Overall Adult tree, sapling, and seedling densities

	Trees/Acre	Average Tree Size	Saplings/Acre	Seedlings/Acre
Average All Units, Pre Treatment	194	8.2	277	581
Average All Units, Post Treatment/Fire	224	8.6	99	377
Percent Change	14%	5%	-178%	-54%

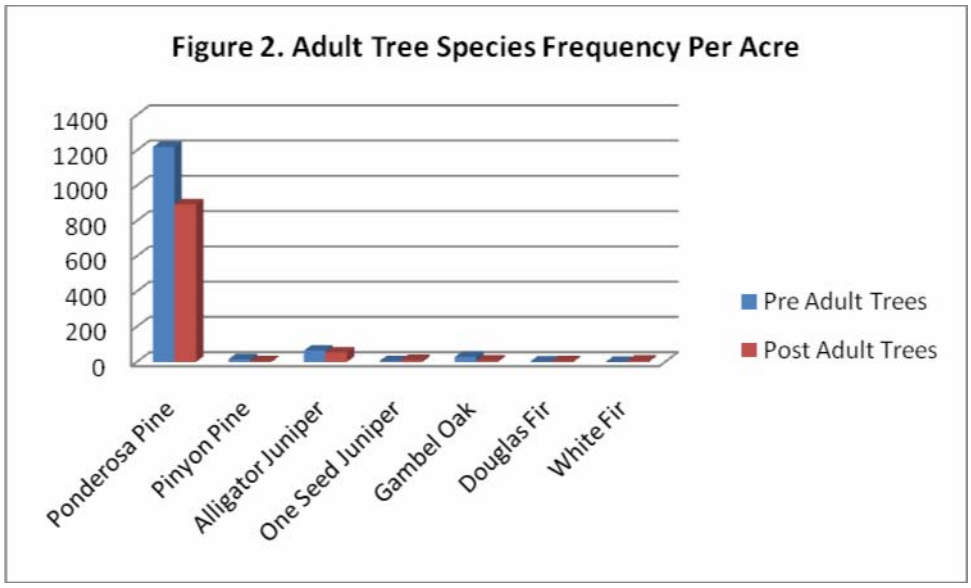
Tree size was fairly consistent across units, with many trees in the smaller size classes, and very few trees in larger size classes within the project area (see Table 3 and Figure 1). Again, differences in the larger tree sizes are due to re-location of transects and not treatment effects.

Table 3. Overall Size Class Distribution

Size Class	Trees per Acre Pre Treatment	Trees Per Acre Post Treatment/Post Fire	Percent Change
4.5-4.9	1026	497	-106%
5-6.9	373	299	-25%

7-8.9	483	346	-40%
9-10.9	303	229	-32%
11-12.9	51	54	5%
13-14.9	12	20	40%
15-16.9	0	7	100%
17-18.9	0	5	100%
19-20.9	2	0	-100%
21+	5	0	-100%

The dominant adult tree species at all sites was ponderosa pine, at 92% pre-treatment and 91% post-treatment/post-fire. Alligator juniper was also present, at 5% pre- and post-treatment/fire. Prior to treatment, the dominant sapling species was gambel oak (37%), followed by alligator juniper (29%) and ponderosa pine (24%). Following treatment/fire, gambel oak remained the dominant species (39%), followed by ponderosa pine (38%) and alligator juniper (15%) (see Table 4, Figures 2 and 3).



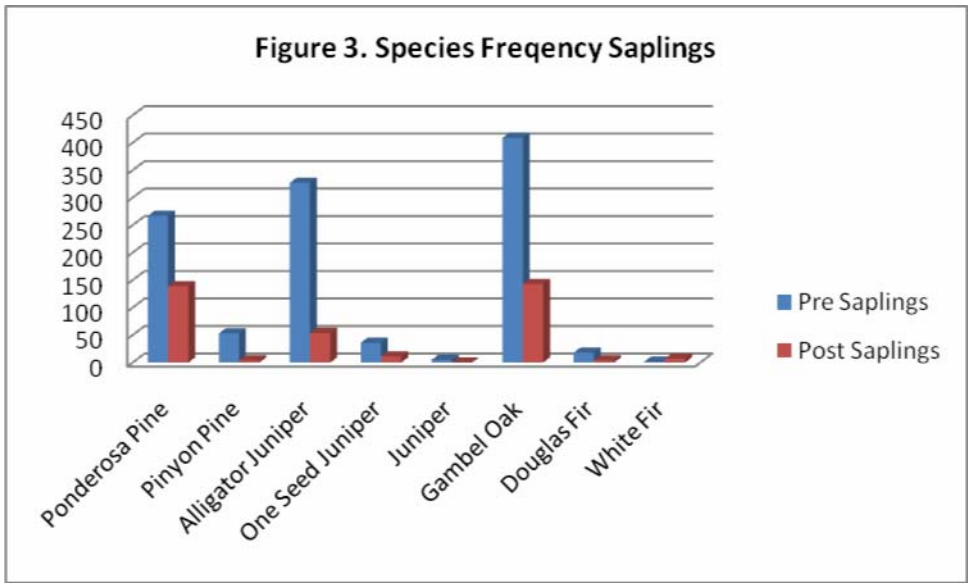


Table 4. Overall Distribution of Adult Trees and Saplings, by Species				
	Adult Trees/Acre Pre Treatment	**Adult Trees/Acre Post Treatment/Fire**	**Saplings/Acre Pre Treatment**	**Saplings/Acre Post Treatment/Fire**
Ponderosa Pine	1219	893	267	139
Pinyon Pine	15	4	53	4
Alligator Juniper	64	54	327	54
One Seed Juniper	4	11	36	11
Gambel Oak	28	143	409	143
Douglas Fir	2	4	18	4

White Fir	0	7	2	7
Total All Species	**1332**	**1116**	**1112**	**362**

Overall Understory Cover

The understory was predominantly litter, both pre- and post-treatment/fire. Though much of the litter was burned in the Ojo Peak fire, many areas were moderately burned, with some charred litter and debris remaining on the ground. Grasses and forbs were sparse at the site, both pre- and post-treatment, with a decline in each cover category, primarily due to fire effects. Bare soil increased after the fire by 51%. (See Table 5.)

Table 5. Overall Understory Cover				
	% Grasses	**% Forbs**	**% Bare Soil/Rock**	**% Litter**
Average All Units Pre-Treatment	8.6	5.7	14.8	85.6
Average All Units Post-Treatment/Fire	3.3	4.2	30.4	64.8
% Change	**-164%**	**-36%**	**51%**	**-32%**

Overall Canopy Cover

Canopy cover differed greatly across sites following treatment/fire. For all sites combined, canopy cover decreased from 56% to 38%, with a -47% change. In areas with treatment (units 25 and 2), canopy cover was significantly reduced: Unit 25 saw a -350% change in canopy cover before and after treatment, while Unit 2 saw a -967% change in cover, following the combined treatment and fire. (See Table 6.)

Table 6. Canopy Cover			
	Pre-Treatment	**Post-Treatment/Fire**	**Percent Change**
Unit 25	36%	8%	-350%
Unit 2	64%	6%	-967%
Unit 3	55%	73%	25%
Unit 4	64%	41%	-56%
Unit 5	63%	63%	0%
Average All Units	**56%**	**38%**	**-47%**

Overall Surface Fuel Load

Surface Fuels were variable at the five sites. Prior to treatment, Units 25, 2 and 3 had relatively low surface fuel loads, whereas Units 4 and 5 had higher fuel loads. Surface fuels increased post-treatment in Unit 25 by 42%. Overall, surface fuels decreased by 57%, largely due to the fire (See Table 7.)

Table 7. Surface Fuel Loads			
	Pre-Treatment	**Post-Treatment/Fire**	**Percent Change**
Unit 25	3.7	6.4	42%
Unit 2	0.97	4.9	80%
Unit 3	2.8	4.2	33%
Unit 4	12.7	2.8	-354%
Unit 5	16.2	4.9	-231%
Average All Units	**7.26**	**4.64**	**-57%**

Pre-Post Comparison Unit 25

During the summer of 2007, the treatment on Unit 25 was completed and post-treatment data was collected at this site. Transects had to be re-established in Unit 25 after the treatment because the rebar was disturbed

during the treatment. They were re-established in close proximity to the original GIS waypoints. In 2008, data was collected again, with one transect needing to be re-established close to the original GIS waypoint. Because little change is expected in tree data between 2007 and 2008, only changes in understory cover and surface fuels are presented for all three years. Tree density, size, and species data are presented for years 2006 and 2007, as in the original report.

Unit 25 Adult Tree, Sapling and Seedling Data

Table 8 shows that the number of trees per acre was reduced from 117 to 40 in Unit 25. The average tree size went up, from 7.9 to 13.5. Saplings were reduced from 173 to 27. Seedlings were also reduced, although not as much as saplings, from 718 to 573. (See Table 8.)

Of the seedlings remaining, 86% were gambel oak, which were left uncut as part of the treatment. An additional 10% were alligator juniper and 4% were pinyon pine. There were no ponderosa pine seedlings remaining after treatment.

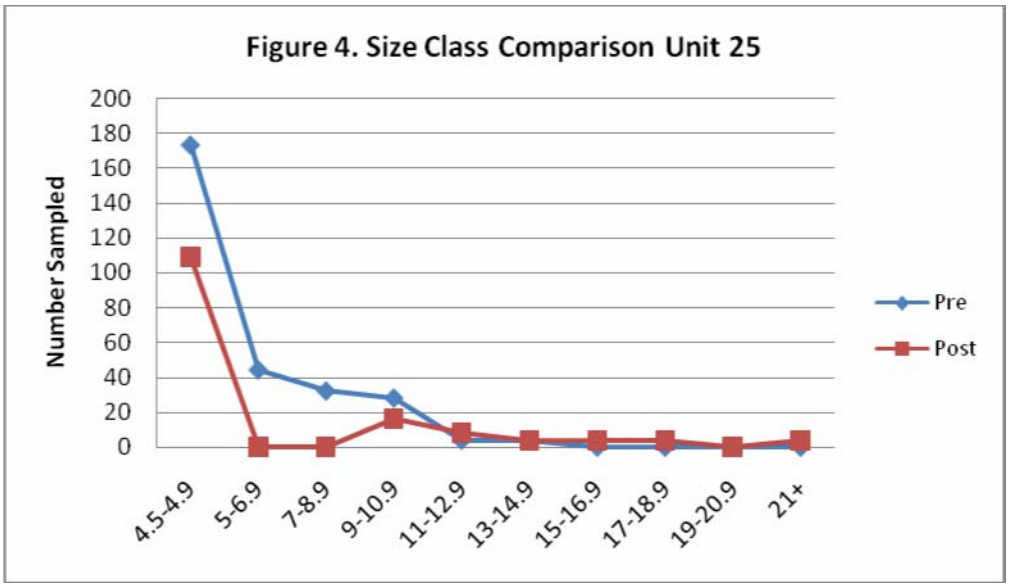
Table 8. Pre-Post Treatment Comparison for Tree Data, Unit 25

	Trees/Acre	Average Tree Size	Saplings/Acre	Seedlings/Acre
Pre Treatment	117	7.9	173	718
Post Treatment	40	13.5	27	573
% Change	-66%	71%	-84%	-20%

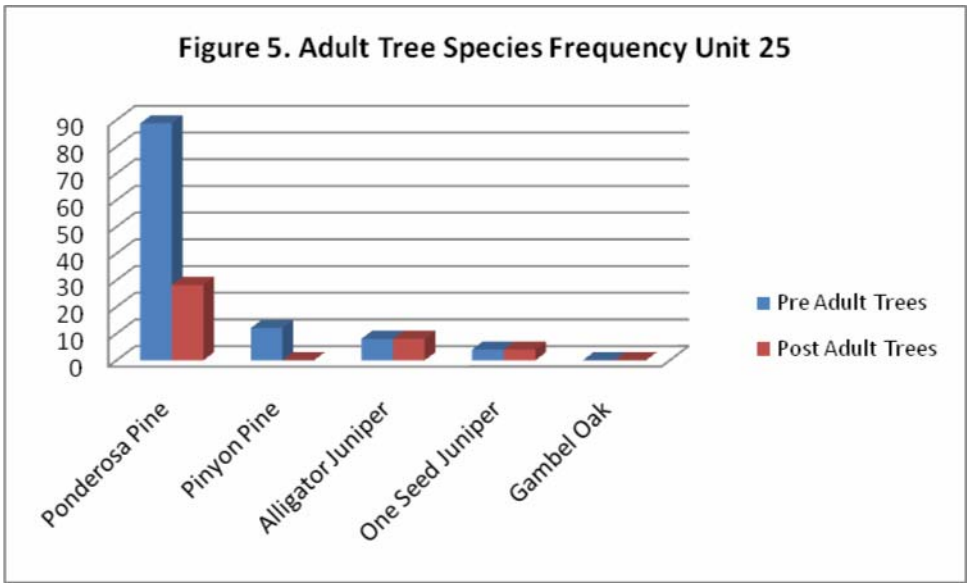
The size class distributions changed as expected, with a reduction in the number of trees in the smaller size classes, and the larger size classes remaining. The average tree size increased by 71%. Saplings were reduced by 84%, and seedlings were reduced by 20%. The appearance of a tree in the 21+ size class post-treatment (when it was not present pre-treatment) is probably due to the re-location of transects (see Table 9).

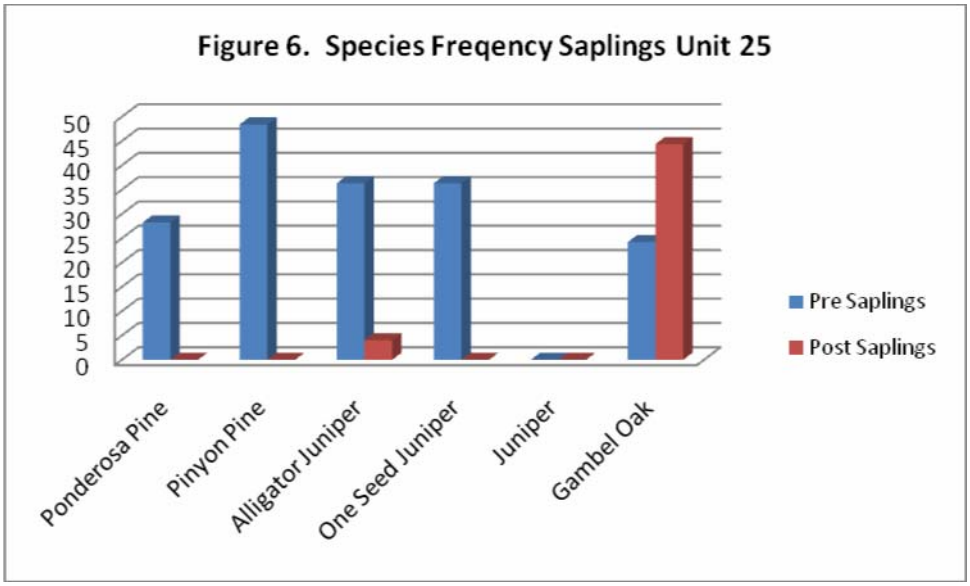
Table 9. Pre-Post Comparison of Size Classes, Unit 25 (Trees per Acre)

Size Class	Pre	Post
4.5-4.9	173	109
5-6.9	44	0
7-8.9	32	0
9-10.9	28	16
11-12.9	4	8
13-14.9	4	4
15-16.9	0	4
17-18.9	0	4
19-20.9	0	0
21+	0	4



In the Pre-Treatment sampling, ponderosa pine was the most frequent adult tree species. This remained true post-treatment, with the total number of trees per acre reduced from 89 to 28 (see figure 6). Pinyon pine was the most abundant sapling, with 48 per acre pre-treatment. Gambel oak was the most abundant species post treatment, with 44 saplings per acre remaining in Unit 25 (see figure 7). Again, this is what would be expected, since the gambel oak was not cut as part of the treatment.





Unit 25 Canopy Cover

Measures of canopy cover for Unit 25 are shown in Table 10. Canopy cover was reduced from 36% prior to treatment to 11% immediately following treatment. In 2008, canopy cover was measured at 8%, or a 383% reduction from pre- to post-treatment. Differences between 2007 and 2008 are likely to relocation or transects.

Table 10. Canopy Cover, Pre- and Post- Treatment for Unit 25			
	Pre (2006)	Post (2007)	Post (2008)
Canopy Cover	36%	11%	8%
Percent Change		-227% (06-07)	-383% (06-08)

Unit 25 Surface Fuel Loads

Measures of surface fuel load for Unit 25 are shown in 11. Surface fuels increased from 3.67 tons per acre prior to treatment to 4.15 tons per acre immediately following treatment. In 2008, surface fuels were measured at 6.37 tons per acre, or a 42% increase from pre- to post-treatment. Differences between 2007 and 2008 are likely to relocation or transects, but indicate that fuels on the site may be higher than originally projected.

Table 11. Surface Fuel Load, Pre- and Post- Treatment for Unit 25			
	Pre (2006)	Post (2007)	Post (2008)
Surface Fuel Load	3.67	4.15	6.37
Percent Change		12% (06-07)	42% (06-08)

Unit 25 Understory Cover

Understory cover changes are represented in Table 12 and Figure 7. Grasses and forbs decreased on the site immediately following the treatment in 2007. There was a -132% change in grass cover at the site from pre-treatment to 1 year post-treatment. Cover provided by forbs decreased by 132% in the pre-post comparison over 2 years. However, cover provided by forbs did increase from 2007 to 2008 by 40% (from 5% cover to 8% cover). Grasses and forbs may have decreased as a result of the increased fuel load on the site or disturbance during treatment, since precipitation was higher in the post-treatment years than the pre-treatment year. Though species composition was not part of this monitoring protocol, invasive thistle was observed along the road into the treatment area in 2008 and should continue to be monitored.

Table 12. Understory Cover, Pre- and Post- Treatment for Unit 25

Cover Category	PRE (2006)	POST (2007)	POST (2008)	% Change 06-08
Estimated % Grass	14.5	10.9	6.3	-132%
Estimated % Forbs	14.5	5.0	8.0	-81%
Estimated % Bare Soil	24.4	18.0	21.1	-15%
Estimated % Litter	70.0	69.9	69.1	-1%