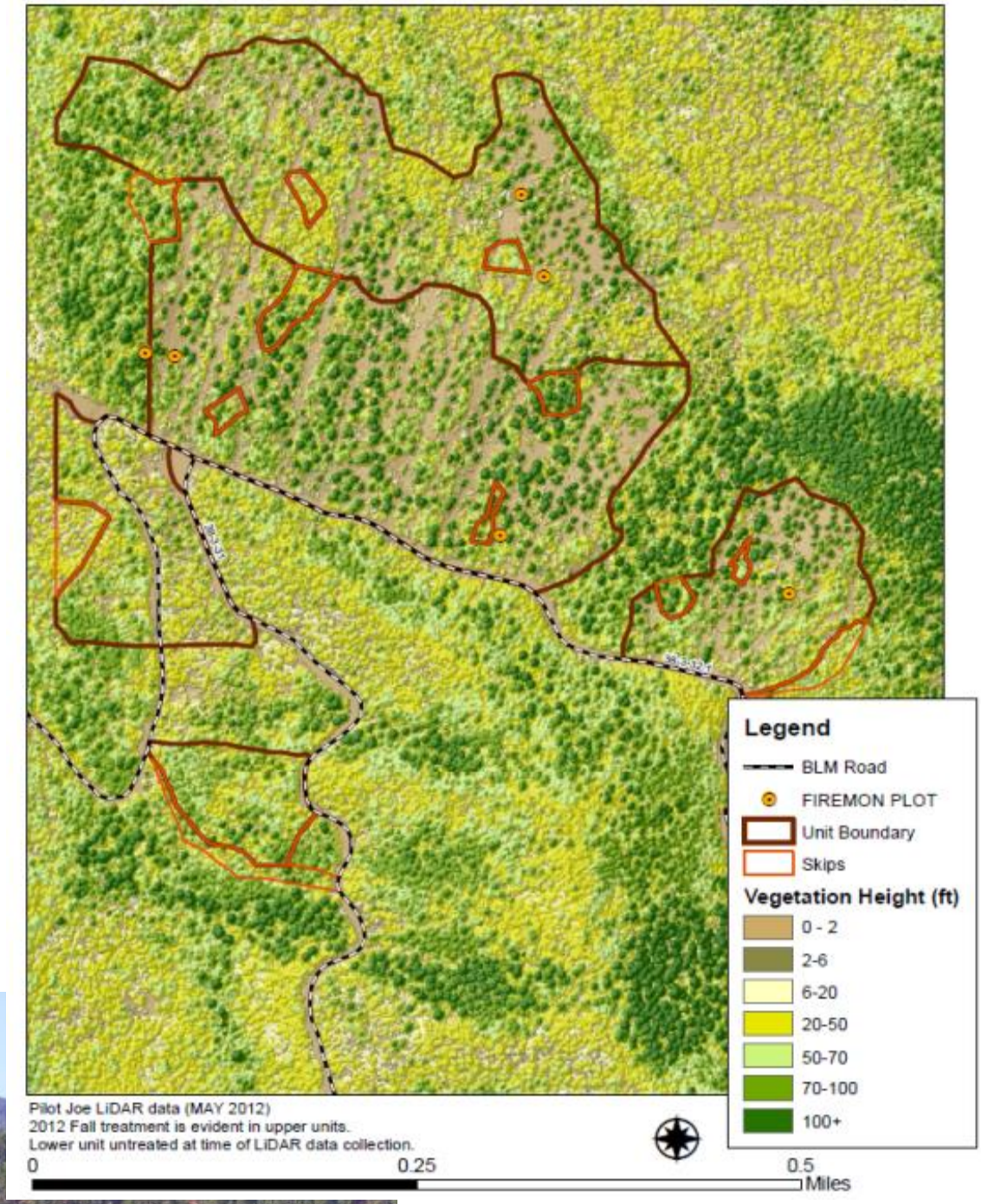
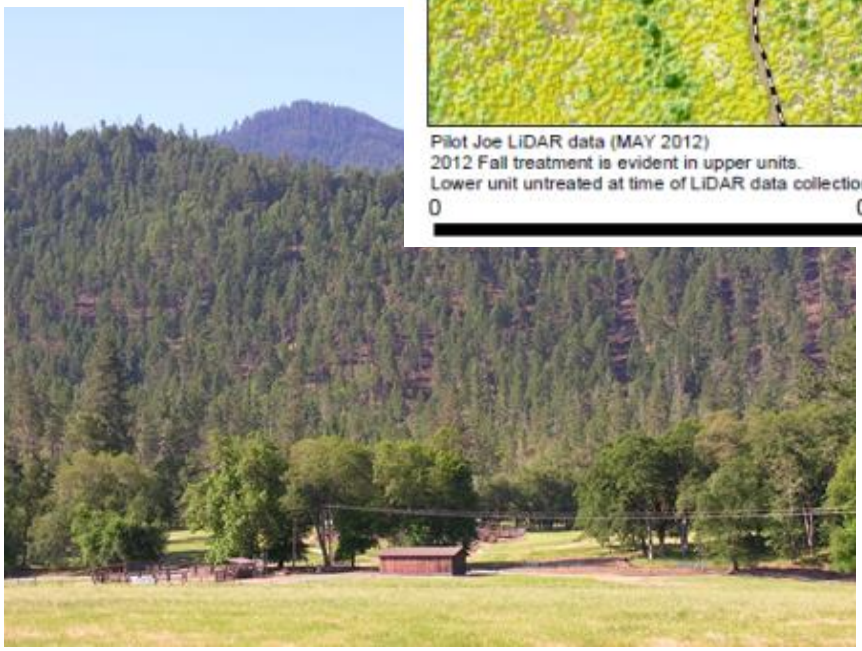
P I L O T J O E



Pilot Joe Canopy LiDAR Imagery May 2012 - Amidst Treatment Implementation.



Landscape view, as seen from near highway 238, of the same completed commercial unit in the above 'aerial' image.

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Pilot Joe Multiparty Monitoring

October 2, 2014

Introduction

The Middle Applegate Dry Forest Restoration Pilot Project is a demonstration based on the dry forest restoration principles developed by Drs. Jerry F. Franklin and K. Norman Johnson. In December 2010, Secretary of Interior Ken Salazar designated several landscape-scale pilot projects in southwest Oregon to demonstrate the application of the Franklin and Johnson restoration principles, support regional workforce and milling infrastructure, and build public support for the active restoration of federal forests.

The first phase focused on a small subset of the Middle Applegate watershed, an approximately 5,000 acre sub-watershed containing Chapman and Keeler creeks. The first phase of the project resulted in the Pilot Joe Timber Sale. Implementation began in fall 2011. As a result of community meetings prior to implementation, a multiparty monitoring team was formed for Pilot Joe.

Multiparty Monitoring Findings

The following pages describe our findings one year post treatment. It is important to note these are short-term, one year post treatment findings, and long term impacts of the treatment may vary from the short term impacts. Follow up monitoring at five and ten year intervals is recommended for more accurate monitoring of treatment impacts. A more condensed version of these findings can be found under Multiparty Monitoring Summary of Results for Pilot Joe at the BLM website: http://www.blm.gov/or/districts/medford/forestrypilot/pilot-projects.php and Southern Oregon Forest Restoration Collaborative's website: http://www.forestrestorationcollaborative.org/publications/.

There are 5 objectives the multiparty monitoring team was tasked to monitor:

Monitoring Objectives and Indicators

Table 1. Middle Applegate Pilot Multiparty Monitoring objectives and indicators. Elements in bold have been completed or are in progress on Phase I: Pilot Joe.

Objective 1: ***Increase forest ecosystem resistance and resilience***	**Objective 2:** ***Increase spatial heterogeneity to benefit biodiversity and species of concern at the stand and landscape scale***	**Objective 3:** ***Conserve and improve northern spotted owl habitat through LSEA (late seral emphasis area) design***	**Objective 4:** ***Generate jobs and support regional manufacturing infrastructure***	**Objective 5:** ***Gauge public support for active management in federal forests***
Indicators: **- Fire behavior** **- Stand density** **- Tree vigor** **- Mean diameter** **- Overstory and understory species composition** **-Snag and down woody material abundance**	**Indicators:** **-Canopy cover** **-Stand level skips and gaps** **-Stand level structural complexity** -Seral stage composition at landscape scale -Bird species composition	**Indicators:** **-Risk of fire spread to LSEA's** -Percentage of NRF, dispersal, and unsuitable habitat -Spotted Owl reproduction and pattern of use	**Indicators:** **- Jobs created or maintained** **- Board feet and ton weight of material harvested** **- Market utilization by product category** **-Implementation and contracting efficiency**	**Indicators:** **- Awareness and support of engaged public** **- Success of community outreach and engagement** - Scoping and EA comments

Objective 1:Indicators and Summary of Results

Increase forest ecosystem resistance and resilience

Indicators:

- Fire behavior - Stand density - Tree vigor - Mean diameter
- Overstory and understory species composition
-Snag and down woody material abundance

Table 2. Indicators and metrics established by the multi-party monitoring group and measured using FIREMON data to assess the attainment of monitoring objectives 1 and 3.

Objective	Indicator	Metric	Results
Increase forest ecosystem resistance and resilience.	Fire Behavior	Stand level fire behavior (modeled)	Treatments reduced the probability of crown fire and potential mortality
	Snag and down woody material abundance	Condition and persistence	Small reduction in 15-20" size class snags Down wood not measured post treatment
	Stand level structural complexity	Size class distribution	Large reduction in trees per acre, proportionally greater reduction in smaller size classes
	Diameter / QMD	tree DBH	Increase in average stand diameter (QMD)
	Stand Density	Basal Area	Reduction in density (~50% of pre-treatment values)
	Tree vigor	Growth Rates & Crown Ratio	No change
	Composition of tree and understory diversity	Tree Species	Decrease in proportion of Douglas-fir, increase in proportion of hardwoods, primarily Pacific madrone, and pines mostly in medium and pole tree size classes
		Understory Species	Data only collected pre—treatment

Methods

The installation of 20 FIREMON plots within the Pilot Joe commercial units occurred in late summer 2011, prior to harvest activity (Figure 1). Plot locations were randomly generated within treatment units and stratified by plant series (Douglas-fire and Ponderosa pine).

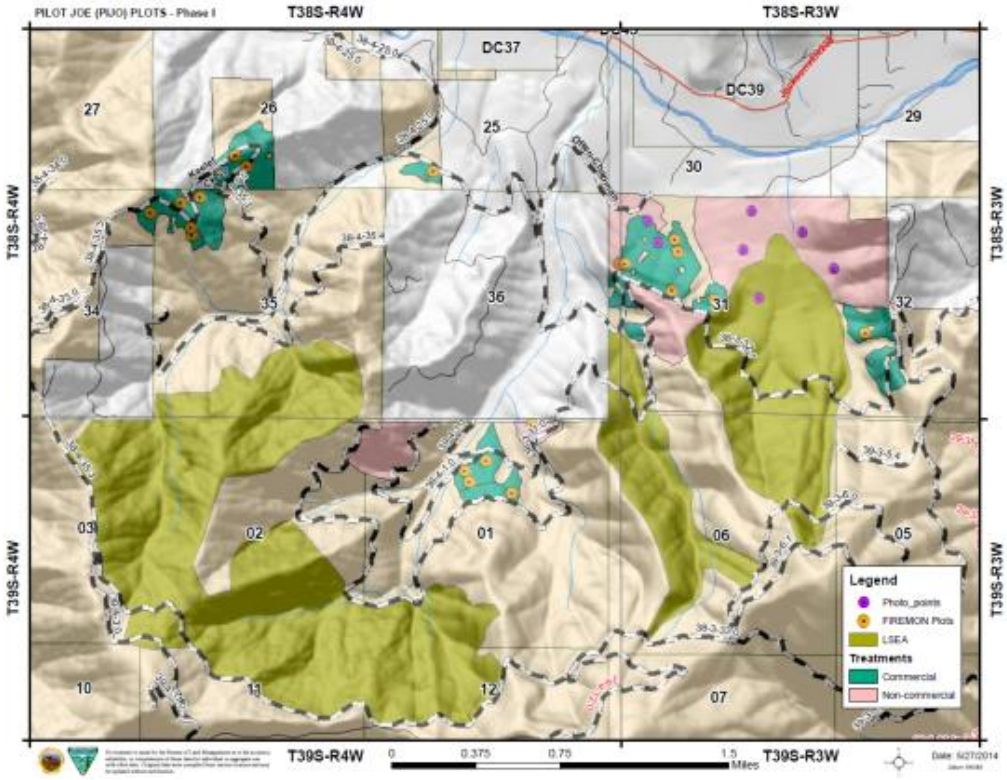


Figure 1. Pilot Joe (Phase I) treatments and plot locations. The light green areas were designated as the LSEAs, teal polygons represent completed commercial treatments, and the peach areas non-commercial treatments. The orange points represent the FIREMON plot locations and the purple circles are permanent photo points.

Results

Fire Behavior

Crown fuels, ladder fuels, and surface fuels all influence potential fire behavior. The re-measurement of canopy and ladder fuels (i.e. trees) occurred following treatments, while re-measurement of surface fuels did not. Handpile burning had not yet occurred at the time of post-treatment data collection. Following both hand-pile burning and any potential underburning, surface fuel loading would be expected to decrease, thus the completion of handpile burning and reduced surface fuels were included in the model assumptions. It will be important to monitor how changes in both live and dead fuels influence potential fire behavior over time.

We used the Fire and Fuels Extension to the Forest Vegetation Simulator (FFE-FVS) to model stand level fire behavior under 97th and 90th percentile fire weather scenarios (Table 3). Fuel moisture and other weather values were determined from analysis SQUAW Remote Automated Weather Station (RAWS) data representing eight fire seasons (July to October 2000-2008). Based on analysis of the RAWS data, approximately 90% of the recorded 10-minute average 20 ft. winds and wind gusts are less than 15mph. Approximately 10% of average wind speeds and

gusts do exceed 20mph, during this analysis period they have been recorded up to 36 mph and 53 mph, respectively

Table 3. Live and dead fuel moisture and weather values used for very dry (97th percentile) and dry (90th percentile) fire behavior scenarios in the Fire and Fuels Extension to the Forest Vegetation Simulator (FFE-FVS).

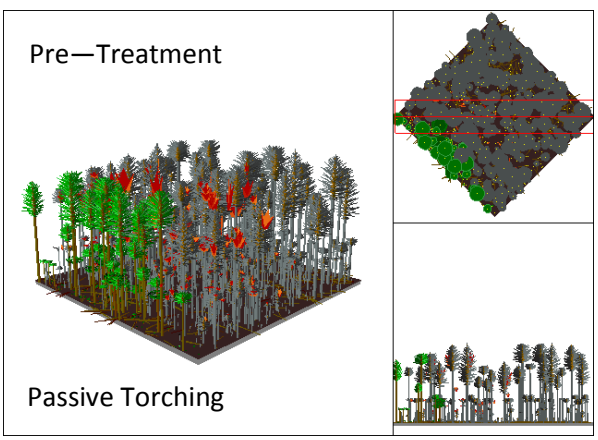
Size Class	Very Dry (97th percentile)	Dry (90th percentile)
0 – 0.25 in. (1 hr.)	3	5
0.25 – 1.0 in. (10 hr.)	4	6
1.0 – 3.0 in. (100 hr.)	6	8
> 3.0 in. (1000+ hr.)	8	10
Duff	20	25
Live Woody	70	75
Live Herbaceous	30	35
Ambient air temperature (°F)	85	80
20 foot wind speed (mph)	15	15

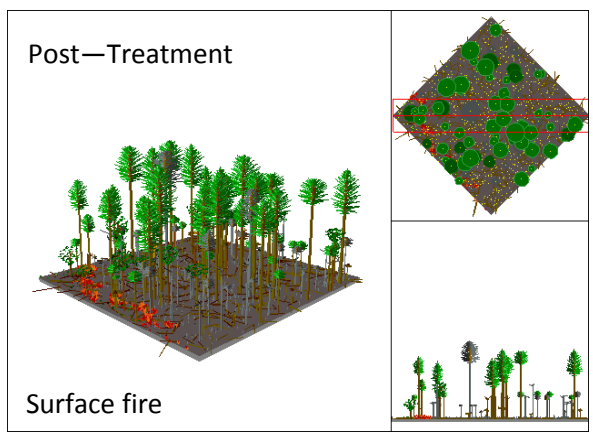
Simulated fire behavior results indicate that flame lengths during a dry wildfire event would hover around the threshold of effective hand crew direct attack capabilities (i.e. 4 feet) (Table 4). The average probability of torching, percent of small patches in a stand where torching can occur, decreased from pre– to post—treatment for both dry (20 to 13 %) and very dry (27 to 18%) weather scenarios, while the range remained highly variable in both situations. The crowning index (CI) (17mph) prior to treatment was within the range of historic recorded 10 min. average winds and gusts, while the post–treatment CI (36 mph) was at the fringe of the recorded historic range. The average canopy base height more than doubled after treatment, though the variability in this measure increased. The canopy bulk density was reduced by nearly half in the post—treatment environment. The median potential basal area mortality shifted considerably from 94% to 22% under very dry conditions and 31% to 17% under dry conditions, indicating considerably less potential economic and resource loss. Although fire behavior modeling predicted an increase in the mid-flame wind speeds after treatment, the treatment effects to canopy, ladder, and surface fuels, resulted in a lower likelihood of sustained crown fire behavior. These stand level fire types of passive torching prior to treatment and surface fire after treatment are illustrated with plot data in Figure 2.

Table 4. FVS-FFE mean (minimum— maximum) fire behavior prediction variables for all units under the very dry and dry fuel moisture scenarios (Table 3). Crowning Index is the wind speed necessary to sustain a crown fire.

	Fire Weather Scenario	Flame Length (ft)	Probability of Torching (%)	Crowning Index (wind mi/hr)	Canopy Base Height (ft)	Canopy Bulk Density (kg/m³)	Median Potential % Basal Area Mortality	Mid-flame wind (mph)
PRE	**Very Dry**	4 (3-7)	27 (0-78)	17 (7-31)	7 (5-10)	0.132 (0.057-0.252)	94 (12-100)	1.8 (1.5-2.3)
	Dry	4 (2-6)	20 (0-65)				31 (12-100)	
POST	**Very Dry**	5 (3-7)	18 (0-80)	36 (9-76)	17 (3-36)	0.067 (0.018-0.211)	22 (5-100)	2.8 (2.1-4.5)
	Dry	4 (3-6)	13 (0-71)				17 (5-100)	

Winds strongly influence fire behavior. Prior to treatments, the model scenario predicted that surface fire would likely occur in 38—54% of plots with 15mph 20 foot winds for very dry and dry conditions, respectively (Figure 3). Under these same weather scenarios, post –treatment surface fire was predicted for 77– 85% of plots. Fire behavior was also modeled with a 20 mph 20 foot wind speed, as this is within upper end of the range of recorded wind speeds for both 10min averages and gusts. Under these extreme conditions, no surface fire was predicted in pre—treatment stands (Figure 2). Overall, treatments have raised canopy base heights, reduced crown bulk density, and increased the likelihood of surface fire over passive torching or active crown fire (Figure 2) in the event of a wildfire.





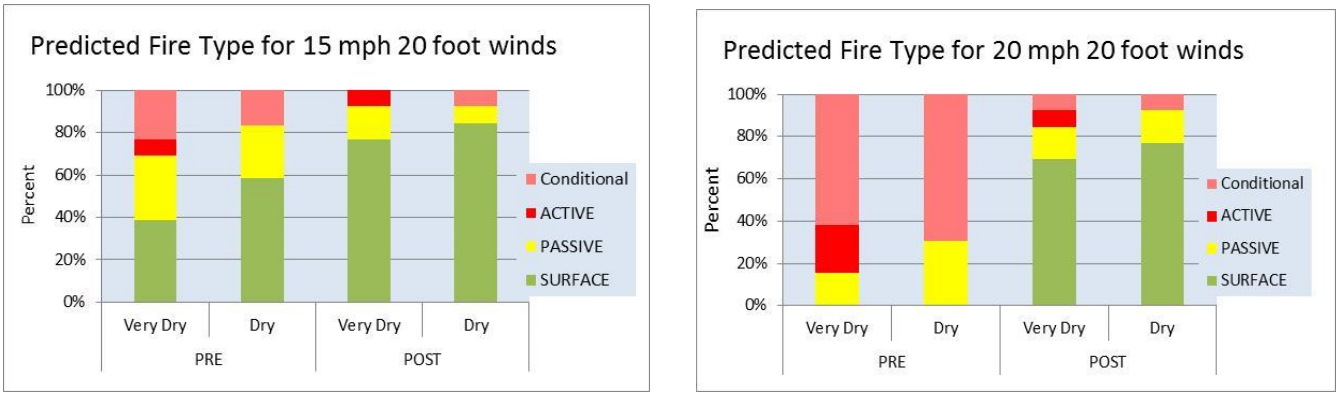


Figure 3. Percent of predicted fire types among plots before (2a) and after (2b) treatment in 13 units for very dry (97th percentile) and dry (90th percentile) fire weather scenarios modeled within FFE-FVS. Fire types include: surface—fires remain on the forest floor, passive torching—some individual or group tree torching, active crown fire—fire moves and stay in the tree crowns, and conditional crown fire—crown fire will not initiate within the stand under the given conditions, but canopy fuels are sufficiently dense to support an active crown fire entering from an adjacent stand.

Pre-Treatment Fuel Loading

Average total dead surface fuel loading was 26.9 tons/acre prior to treatments (Table 5). The greatest contributors were large diameter fuels (3+ inches) and duff. There was an average of 1.5 tons/acre of live shrub biomass and 1/3 ton/acre of live herb loading. The average fuel bed depth was 2.5 feet. Fuel transects were not re-measured one year after treatments, as surface fuel treatments had not yet been completed at the time of data collection.

Table 5. Average (minimum— maximum) pre-treatment surface fuel loading (tons/acre) for all plots based on FFI calculations.

	Litter	Duff	1-100HR	1000HR+	Total Dead	Live Herb	Live Shrub	Fuel Bed Depth (ft)
ALL PLOTS	4.7 (2.2-12.1)	7.9 (1.4-8.8)	4.9 (2.4-12.4)	9.5 (0.4-32.0)	26.9 (8-47)	0.3 (0-1)	1.5 (0.2-2.7)	2.5 (0.2-6)

Stand Level Structural Complexity

There was a large reduction in trees per acre (tpa), with a proportionally greater reduction in small diameter size classes, particularly 1-5 inch dbh (Figure 4).

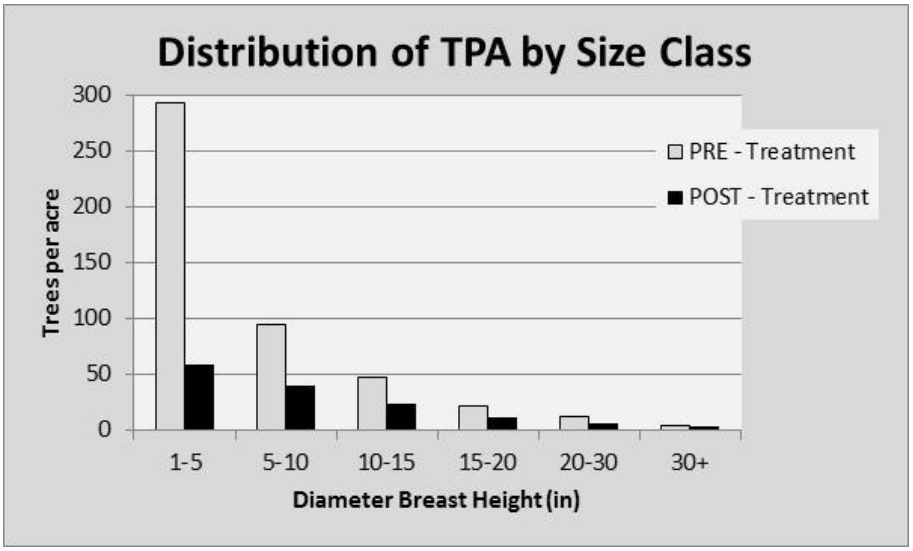


Figure 4. Distribution of average trees per acre by diameter size class (dbh in.) for pre and post treatment plots (n=20).

Treatments reduced basal area in all size classes. The greatest reduction (-74%) occurred in the 1-5" class, while the least (-9%) occurred in the 30+ size class. Treatments resulted in reduced basal area in the remaining size classes by approximately 40-55% on average. Prior to treatments, the 10-15" dbh size class had the highest basal area, while after treatments the 30+ size class filled this role (Figure 5).

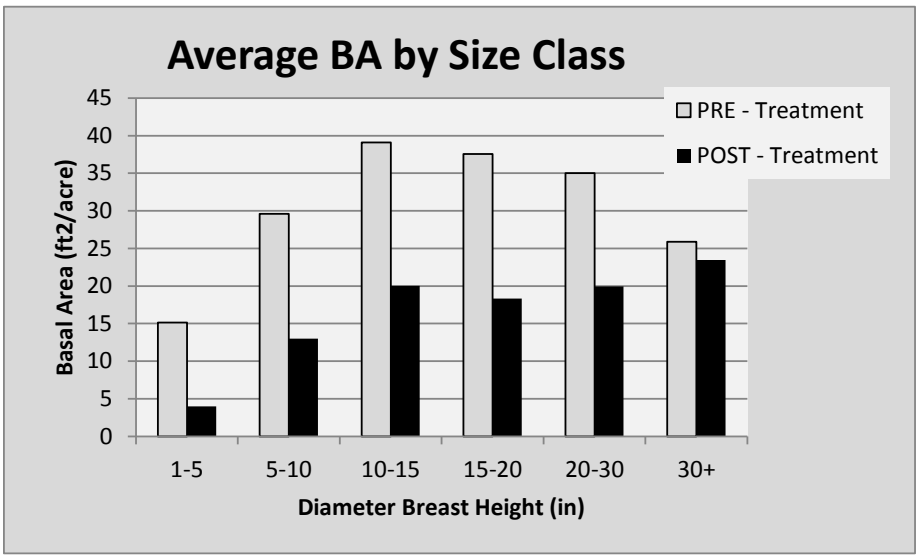


Figure 5. Distribution of average Basal area (ft2/acre) by diameter size class (dbh in.) for pre– and post- treatment plots (n=20).

There was no significant change in snag composition. Snag occurrence was highly variable in all plots. In all plots the 5-10 inch diameter size class contributed the greatest average number of snags per acre, and there was a slight increase after treatment. Snags greater than 10 inches diameter occurred in small numbers. There were slight reductions in the 10-20 size class, while snags greater than 20 inches did not change between treatments (Figure 6).

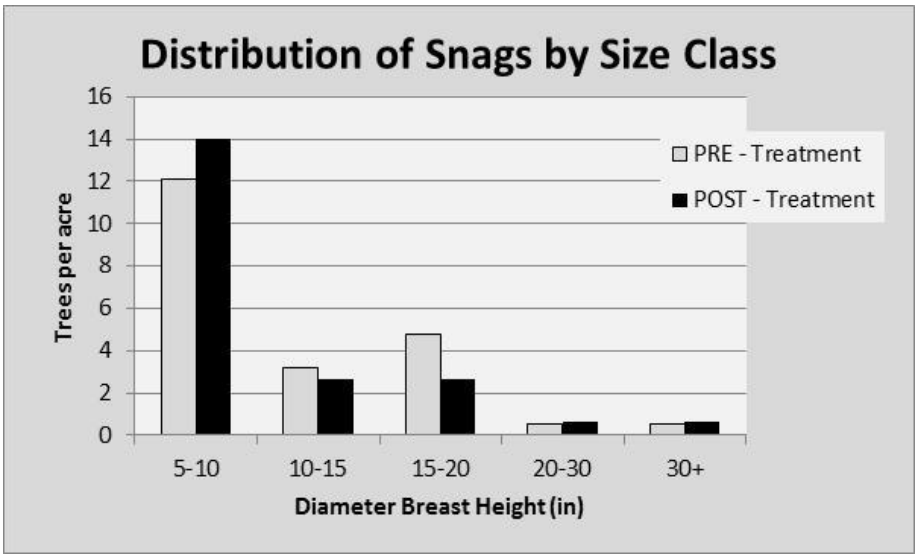


Figure 6. Average snags per acre by diameter size class before and after.

Stand Structural Characteristics

Stand level structural characteristics, including: mean diameter at breast height, crown ratio, basal area, and trees per acre, prior to treatments (post decades of fire exclusion) were averaged at the plot level and then an average was calculated across all plots, with the exception of trees per acre (tpa) and basal area (ba), where only an average across all plots was calculated (Table 6).

The coefficient of variation represents the ratio of the standard deviation to the mean, and it is a useful statistic for comparing the degree of variation from one data series to another, regardless of similarities in the data. The higher the coefficient of variation, the greater variability there is in the data set. Creating, or increasing, spatial heterogeneity is an objective of the Pilot Joe project. Spatial heterogeneity, or variability, is difficult to measure with averages and other traditional statistics. We intend to look at the coefficient of variation for certain variables to see how it changes after treatments.

Table 6. Average (90% confidence) plot attributes for mature and sapling (>4.5 feet in height) live trees (n=20). Max SDI = 530.

Descriptive Statistics		QMD	Crown Ratio (%)	Trees (per acre)	BA (ft2/acre)	RDI
Average (max-min)	PRE	9 (4-14)	33 (21-64)	474 (180-1100)	182 (53 - 325)	0.66 (1.0-0.25)
	POST	12 (6-22)	35 (19-60)	145 (30-450)	99 (22-209)	0.32 (0.08-0.64)
Coefficient of Variation (COVAR) (between plots)	PRE	0.31	0.32	0.54	0.33	0.29
	POST	0.34	0.32	0.73	0.52	0.50

There was a large reduction in trees per acre (tpa), with a proportionally greater reduction in small diameter size classes, resulting in an increase in the average stand diameter (QMD) by 3 inches. Treatments reduced basal area by approximately half on average, but the variability around this number increased, suggesting a more heterogeneous distribution. Relative Density

Index values decreased from pre– to post– treatment, while the covar (i.e. variability) increased. In general, data suggests treatments decreased stand densities and increased diameter and the variability in stand structural characteristics.

Tree Vigor

Crown ratios did not change noticeably between pre –treatment and one year after treatment. This metric will also take time to respond to new conditions (Table 6).

Among all plots, 31 overstory trees were cored to determine the most recent 10 year growth rates, as a measure of vigor. The trees had an average growth rate of 0.41 inches. Growth rates ranged from 0.1 to 1.5" (Table 7). The dbh of cored trees ranged from 10-35.5 inches and averaged 18" dbh. These trees were an average of 90 years old, and ranged in age from 58-175 years. This variable will take time to change in response to the altered conditions.

Table 7. Average ten year growth rate (inches) among 31 sampled trees prior to treatment.

	10yr radial growth rate (in)	DBH	Age
AVG	0.41	18	90
Min	0.1	10	58
Max	1.5	36	175

Species Composition

Trees

Douglas-fir (*Pseudotsuga menziesii)* was the dominant species both before and after treatment, comprising 73% of trees per acre (tpa) of stands before treatment and 61% after treatment. Pacific madrone (*Arbutus menziesii)* represented 15% of the pre—treatment and 21% of the post—treatment stand composition. California black oak (*Quercus kelloggii)* comprised about 10%, while comparatively; Pine *(Pinus ponerosa and lambertiana)* and Oregon white oak (*Quercus garryana)* species had minor representation (Table 8 and Figure 7). The increase in post-treatment representation by white oak was due to data collection errors.

Table 8. Tree species common and scientific names and corresponding code used in the following graphs.

CODE	Species Name
ARME	**Pacific madrone** (*Arbutus menziesii)*
CADE27	**Incense cedar** (*Calocedrus decurrens)*
PINE	**Ponderosa and Sugar Pine** *(ponerosa and lambertiana)*
PSME	**Douglas-fir** (*Pseudotsuga menziesii)*
QUCH2	**Canyon live oak** (*Quercus chrysolepis)*
QUKE	**California black oak** (*Quercus kelloggii)*
QUGA4	**Oregon white oak** (*Quercus garryana)*

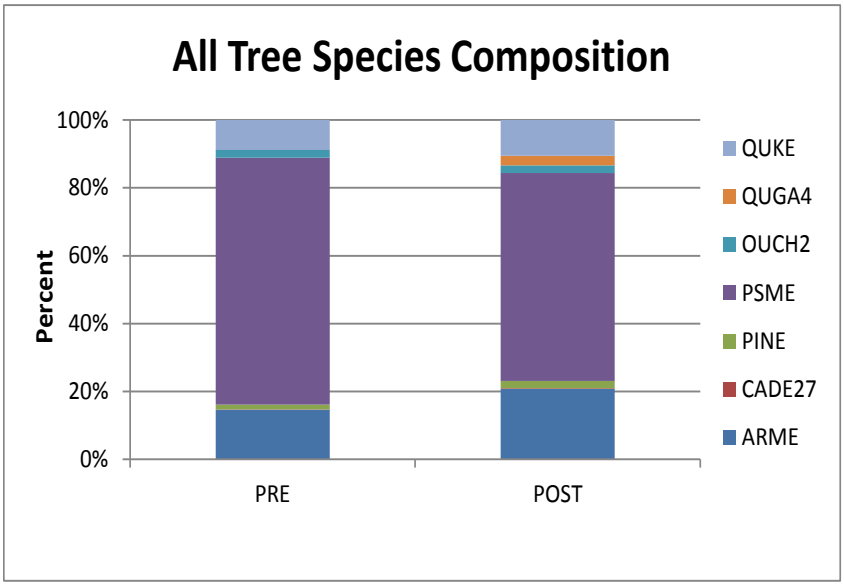


Figure 7. Species composition of all trees per acre before and after treatment

Large tree species composition changed little from before to after treatment. Among all plots, both before and after treatment, the dominant tree species greater than 20" DBH was Douglas-fir (80-90%). California black oak represented 8-13% of large trees, and increased slightly post treatment in the 20-30"DBH size class. Pacific madrone and Oregon white oak+ had minor presence (Figure 8).

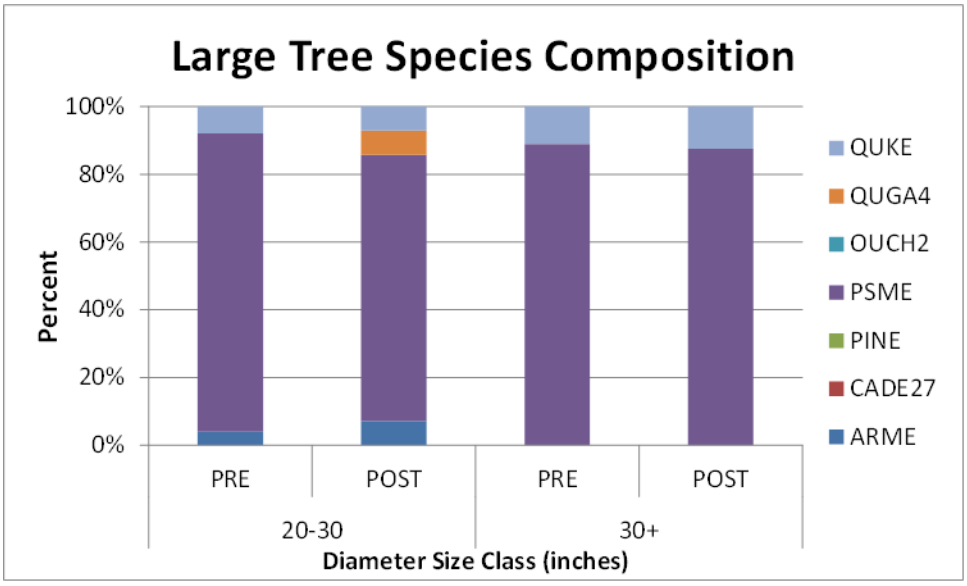


Figure 8. Species Composition of all large trees per acre 20-30+ inches DBH and > 4.5 ft in.

Species composition shifted towards greater proportions of Pacific madrone with the corresponding decrease in the proportion of Douglas-fir. After treatments, the proportion of pine was largest in these diameter classes than in others. Alternatively, the proportion of California black oak was smallest compared with other size classes, and Oregon white oak was not present. The proportion of Canyon live oak increased post treatment in the 10-15" DBH size class.

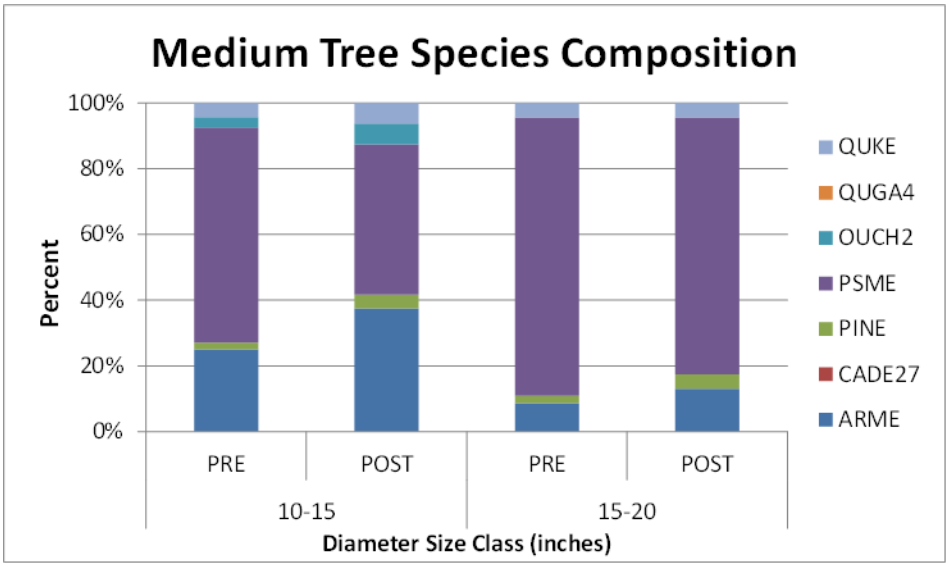


Figure 9. Species Composition of all medium trees per acre 10-20" DBH and > 4.5 ft in

For both of the size classes, 1-5 "DBH and 5-10" DBH, the dominant tree species prior to treatments was Douglas-fir, which was reduced post treatment. In the 5-10" DBH size class, the dominant species shifted to Pacific madrone. California black oak was 7-18%, and pine representation 2%, both proportionally increased after treatment. There was minor representation by Incense cedar and Oregon white oak[+]. The proportion of canyon live oak decreased significantly in the 1-5" size class, and decreased in the 5-10" size class (Figure 10).

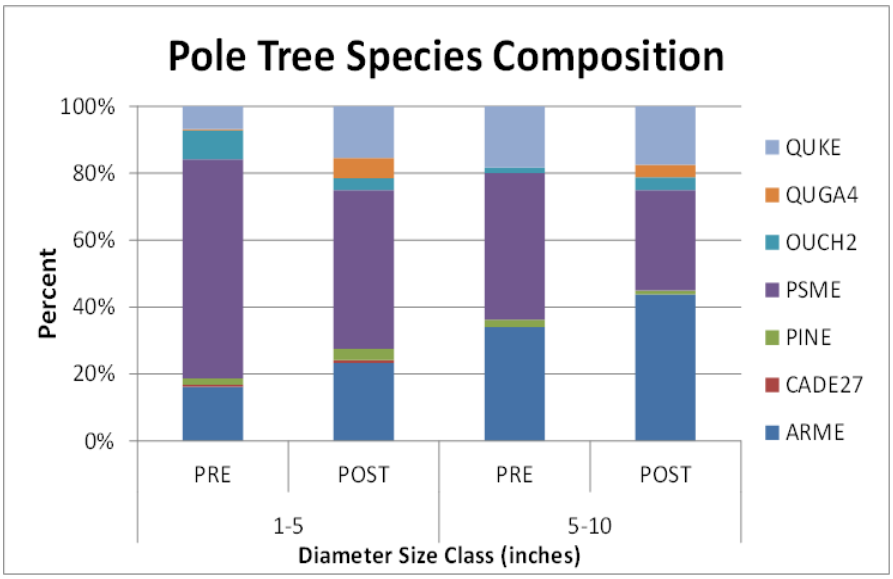


Figure 10. Species Composition of total pole trees per acre 1-10" DBH and > 4.5 ft in.

Among all plots the composition of seedling tree species (<4.5 feet tall) both before and after treatments was mixed. Prior to treatments California black oak*, Douglas-fir, Pacific madrone, and canyon live oak each represented approximately 24% of the population. Pine, Oregon white oak and Incense cedar had minor representation. The seedling species composition shifted slightly in the post-treatment situation. The proportion of both Pacific madrone and pine increased by about 5%, while Douglas fir decreased by approximately 5%.

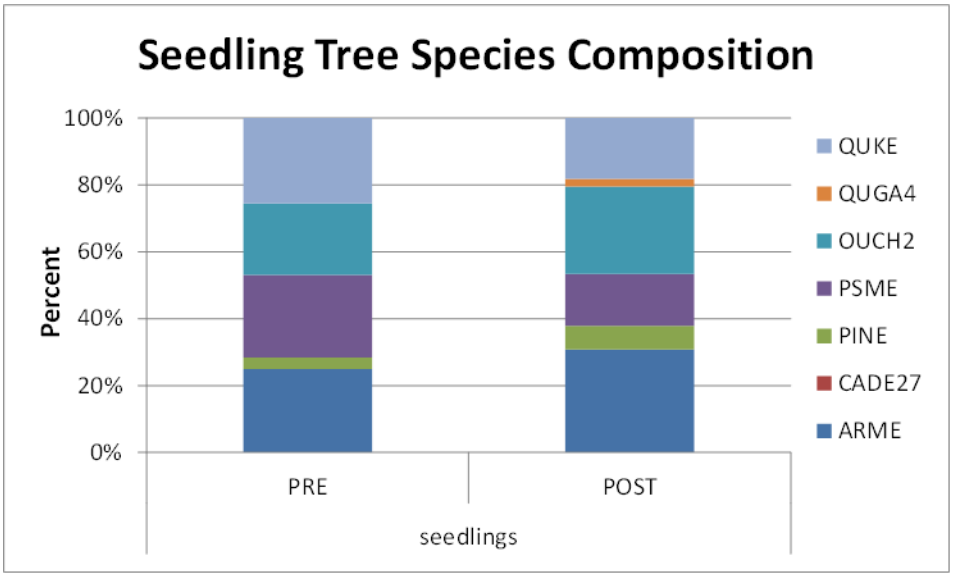


Figure 11. Species Composition of total seedling trees per acre < 4.5 ft in height. The increase in post-treatment representation by white oak was due to data collection errors. Seedlings <0.5 feet in height are included, this particularly affects the number of California black oak.

Pre-Treatment Understory Species Composition

All understory (i.e. herbs, forbs, and grasses) plant species were native. The average species richness, or number of unique species encountered was determined at three spatial scales, alpha (i.e. plot), beta (stand or plant series strata) and gamma (all plots, or the entire project area). Plot level (alpha) species richness was relatively similar between Douglas-fir and pine strata. The entire Douglas-fir strata had greater species richness than the pine strata. The greatest species richness occurred at the project (gamma) scale (Table 9).

Table 9. Species richness for both plant series prescriptions prior to treatments at the plot, stand and project level.

Species Diversity	PIPO	PSME
ALPHA (plot)	9	11
BETA (plant series strata - stands)	26	43
GAMMA (Pilot Joe)	50	

Douglas-fir stands had a greater average percent of understory cover than Pine stands (62% vs. 41%). Average combined grass and vine cover was about 50% in the understory of Douglas-fir plots. Shrubs and grasses contributed to the majority of understory cover in Pine stands (35%) (Figure 12).

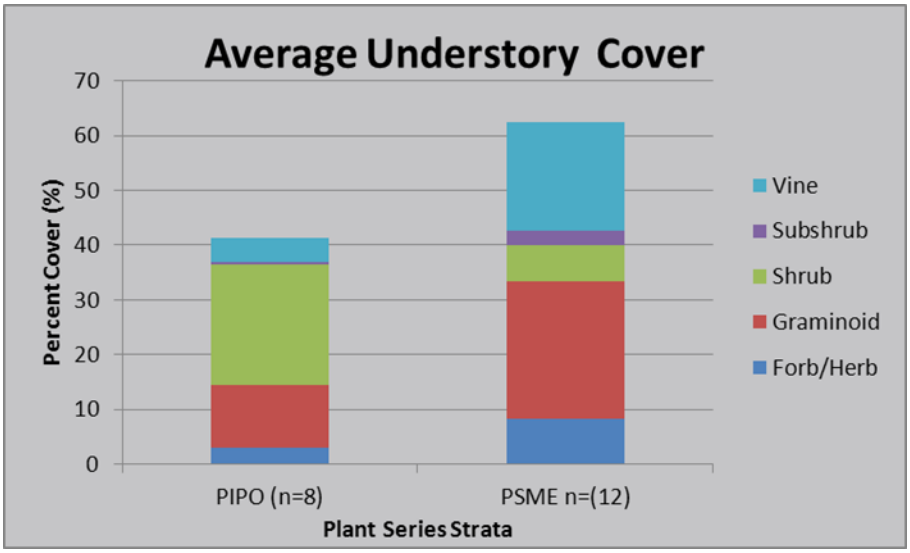


Figure 12. Average percent cover of understory vegetation in both plant prescriptions prior to treatments (n=20). All vegetation was native.

Conclusions

Overall, treatments decreased the likelihood of crown fire and increased stand resilience and resistance to fire. Data collected one year after treatments shows that treatments raised canopy base heights, reduced crown bulk density, and increased the likelihood of surface fire over passive torching or active crown fire in the event of a wildfire.

Measures of stand vigor, growth rate and crown ratio, will take time to respond to the post-treatment conditions and were either not inventoried or remained unchanged from before treatment. There was a large reduction in trees per acre, with a proportionally greater reduction in small diameter size classes. Treatments reduced basal area in all size classes, but increased variability in basal area between plots. Data suggest an overall increase in diameter and variability in stand structural characteristics between plots.

In general, the reduction of Douglas – fir provided for a more heterogeneous composition of tree species after treatment among most tree size classes. While the overstory species composition of large trees (greater than 20” DBH) remained similar after treatment, diversity in medium and pole sized tree composition changed slightly post—treatment. Continued monitoring will provide information regarding changes in the long—term species composition and successional development.

Understory species composition was not measured immediately following treatments, as the response of this metric will take time and only small initial changes were anticipated.

Snags remained the same after treatment, except for a loss of ~2 snags/acre in the 15”-20” size class. On average, there were approximately 20 snags per acre less than 20” dbh, while snags larger than 25” dbh occurred at a rate of one or less per acre. Down wood was not sampled post-treatment, because prescribed burning treatments had not been completed.

Continued monitoring will inform long-term resilience and changes in metrics that take time to respond (i.e. understory species diversity, fuel loading, tree vigor, and predicted fire behavior).

Objective 2:Indicators and Summary of Results

Increase spatial heterogeneity to benefit biodiversity and species of concern at the stand and landscape scale

Indicators:

-Canopy cover
-Stand level skips and gaps
-Stand level structural complexity
-Seral stage composition at landscape scale
-Bird species composition

Table 10. Indicators and metrics established by the multi-party monitoring group and measured using spatial heterogeneity data to assess the attainment of monitoring objective 2.

Objective	Indicator	Metric	Results (post-treatment)
Increase spatial heterogeneity to benefit biodiversity and species of concern at the stand and landscape scale	Canopy cover	Canopy closure variability (coefficient of variation) among sample points	Decrease in canopy closure; increase in canopy variability & patchiness
	Stand level skips and gaps	Percentage of transect length in gaps, average gap size, % of transects with gaps	Increase in % of transects in gaps & # of transects with gaps; avg. gap size similar
	Stand level structural complexity	Regularity of tree distribution (Winkelmass – continuum of uniform to random to clumped)	No significant difference. Trees randomly distributed with slight tendency toward clumpiness (same as pre-treatment condition)
		Small-scale variability in tree spacing (coefficient of variation in distance between nearest & farthest neighbors)	No significant difference

Introduction

One of the objectives of the Pilot was "to increase spatial heterogeneity to benefit biodiversity and species of concern at the stand and landscape scale." Spatial heterogeneity was defined in the Pilot EA (p 2-4) as "*mov[ing] the current condition of crowded, uniform forest stands to site conditions that are more open and spatially heterogeneous (clumpy) in nature.* " Restoring spatial heterogeneity is a key element of forest restoration as defined by Franklin and Johnson (2013). Traditional thinning and fuels reduction often leaves relatively homogeneous forest structures, e.g., of evenly spaced trees; more variable forest structures may be beneficial for some wildlife species, reduce crown fire potential, and increase regeneration of desirable shade intolerant tree species and other plants, among other benefits.

Churchill et al (2013) characterized stand level spatial patterns in terms of individual trees, tree clumps, and openings. To derive spatial patterns, a stem map is constructed. Previous research on stand spatial patterns has also used stem mapping and evaluated tree distribution in terms of spatial statistics such as Ripley's K. Due to the cost and complexity of these approaches, we felt they were not well suited for multi-party monitoring. Instead, we chose to focus on measurements that were repeatable by a largely volunteer crew of non-professionals and would shed light on if and how spatial patterns changed as a result of the Pilot Joe commercial timber harvest.

The indicators chosen and specific metrics we measured for each indicator are listed above. In many cases the variation in the metric was itself the measure of spatial heterogeneity. For example, we would expect canopy density to decrease as a result of treatment, but did it also become more variable and "patchy" or was it uniformly less dense? If the average canopy closure is reduced following treatment by the same amount everywhere, then variability has not changed. If it is reduced on average, and is also more variable, this would be evidence of increased heterogeneity.

Objectives

- Determine if the Pilot Joe Commercial treatment resulted in a change in spatial heterogeneity in terms of the following metrics:
    - The coefficient of variation of canopy closure among sample points, a measure of canopy patchiness;
    - The regularity of tree distribution (Winkelmass), a measure of tree clumpiness (Aguirre et al 2003);
    - The coefficient of variation in distance between neighboring trees, a measure of small-scale variability in tree spacing.
- Determine how treatment changed the size and distribution of canopy gaps.

Methods

We developed a protocol for measuring fine scale (within-stand) spatial variability using the following measurements:

- Canopy closure (Korhonen et al 2006) variation among five points separated by 100' transects;
- Regularity of tree distribution (on a continuum from uniform to random to clumped) of the four trees nearest the plot center (trees 8" DBH and larger, any species);
- Variation in the distance to the nearest and farthest neighbor among four trees closest to plot center (trees 8" DBH and larger, any species);
- Presence, size, and number of gaps along linear transects. Gaps were defined as openings between tree canopies (dripline to dripline) that were at least 30' in length and not interrupted by canopy from other trees that were greater than 30' in height.

The protocol included measurements of the above metrics in "plots" that included five sample points separated by four 100' transects. Plot layout is depicted below. We collected data in a total of 16 "plots" whose centers were co-located with the FIREMON plots. All plots were located in Pilot Joe commercial harvest units and were measured before and after treatment. Subsequently, we collected data in 6 plots in the Pilot Thompson commercial harvest units, prior to treatment. These plots were also co-located with FIREMON plots. Measurements collected at each sample point included canopy closure (measured with a densiometer in four cardinal directions and averaged), the Winkelmass value of the four trees at least 8" DBH nearest plot center, and the distance to the nearest and farthest tree among the four trees at least 8" DBH nearest the plot center (i.e., the same trees used for the Winkelmass determination).

Plot Layout

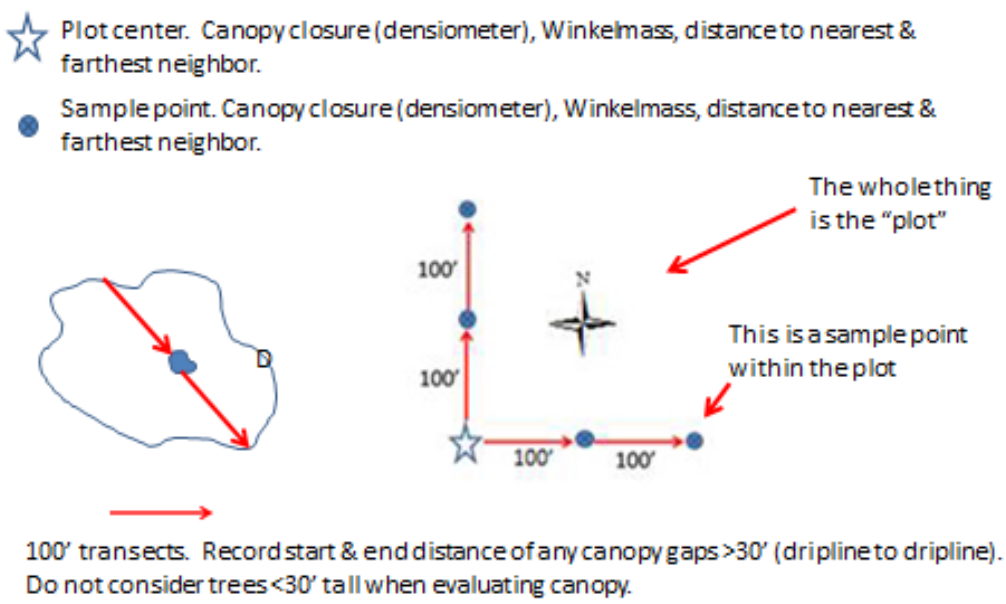


Figure 13. Plot layout used for collecting spatial heterogeneity data.

Results

Canopy closure

Average canopy closure decreased from 75% before treatment to 46% after treatment, as would be expected for a heavy thinning. Variation in canopy density at the within-plot level (accounting for 5 measurements separated by 100' transects) increased from a coefficient of variation of 15% prior to treatment to 49% after treatment. This indicates that within plots, canopy closure was not only lower on average after treatment, but it was also substantially more variable, with canopy gaps interspersed with denser patches. Canopy closure variation also increased at a coarser (between-plot) scale.

Regularity of tree distribution

Trees were randomly distributed, with a slight tendency towards clumping, prior to treatment (Winkelmass average value 0.62). Following treatment there was a small increase in the number of points with a more clumpy tree distribution (Winkelmass value of 1.0) and a small increase in the average value, to 0.64, but these increases were not significant in a practical sense.

Variation in distance between neighbors

As expected, treatment increased the average distance between neighbors. The coefficient of variation for the distance between the farthest and nearest neighbor increased slightly for both the within plot scale (53% pre-treatment to 60% post-treatment) and between plot scale (28% to 32%). These small changes do not provide much evidence of an increase in the small-scale variability in spacing between trees.

Gaps

The portion of the transect length in gaps increased from 18% prior to treatment to 45% after treatment. Average gap length increased slightly, from 65' to 68'. The proportion of transects with at least one gap increased from 30 to 67%.

Pilot Joe compared to Pilot Thompson

Pre-treatment conditions in Pilot Thompson (canopy closure and Winkelmass) were very similar to those in Pilot Joe.

Conclusions

Overall, these results suggest that fine-scale spatial heterogeneity increased following treatment, but not by every measure. Canopy closure decreased as expected, but there also was a substantial increase in the variability of canopy closure within plots – in other words, patches of denser canopy were intermingled with canopy gaps. Tree distribution was already random prior to treatment, and remained that way after treatment. Similarly, there was little change in the small-scale variability in tree spacing as a result of treatment. However, a more typical thinning treatment might have resulted in a more uniform or dispersed tree distribution (i.e., a lower Winkelmass value) and a decrease in small scale variability in the distance between neighbors. The number and proportion of the area in gaps increased greatly, although the average gap size did not, suggesting that much of the increase was due to many small gaps rather than fewer,

larger gaps. At a larger scale, the variation in canopy closure among plot increased and there was also increased variation due the mingling of treated areas and "skips" within the stands, although this was not quantified. At the between-stand and landscape scales, there was an increase in spatial variability due to the contrast between lower density treated and higher density untreated (e.g., LSEAs) areas, although this also was not quantified.

While fine-scale spatial heterogeneity increased, it's not yet clear what difference this will make. Will there be an increase in regeneration of trees and shrubs? Has habitat diversity increased, and will this benefit species of concern? How would the variation in spatial structure affect fire behavior, both immediately after treatment and following a decade of regrowth? How will the variability in density affect tree vigor and growth, at the individual tree and stand levels? Some of these questions may be answered with planned re-measurements in five years. Others require more research or could potentially be modeled, but are beyond the scope of this monitoring effort.

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Objective 3: Indicators and Summary of Results

Conserve and improve northern spotted owl habitat through LSEA (late seral emphasis area) design

Indicators:

-**Risk of fire spread to LSEA's**

-Percentage of NRF, dispersal, and unsuitable habitat

-Spotted Owl reproduction and pattern of use

Indicators in bold were completed. Other indicators were not completed due to lack of resources.

Table 11. Indicators and metrics established by the multi-party monitoring group and measured using spatial heterogeneity data to assess the attainment of monitoring objective 2.

Objective	Indicator	Metric	Results
Conserve and improve northern spotted owl habitat through LSEA (late successional emphasis area) design.	Risk of fire spread to LSEAs	Modeled landscape fire progression	Treatments slowed predicted fire spread to the LSEA located closest to the valley floor.

Methods

The treatment design intended to reduce the risk of fire to the Late Successional Emphasis Areas (LSEAs), primarily from fires starting near the valley floor. To test the design effectiveness, we modeled fire growth both before and after treatments. The weather parameters included very dry (97th percentile) fuel moistures and two different scenarios associated with the growth of historic wildfires in the Applegate (Squires Peak (2002) and Quartz (2001)). The modeled scenarios assumed no suppression and used an historic ignition in the valley bottom to initiate the fire. The locations of potential future ignitions are unknown and would strongly influence fire spread across the landscape. These modeling scenarios incorporate many assumptions and have limitations; the results help to evaluate treatment design effectiveness.

Results

Fire Spread — Quartz Fire Historic Weather Scenario

Under the pre-treatment conditions, model results predicted that fire would reach the LSEA closest to the valley floor within the fourth burn period. Modeling did not predict that fire would spread to the large LSEAs located along the major ridgeline during the modeling period.

Under the post-treatment modified landscape, treatments appear to have slowed fire spread, primarily to the LSEA located closest to the valley floor. For the burn period analyzed, the model

did not predict that fire would reach many of the additional LSEAs, or that fire would take several days to reach these areas. Thus, treatments had little effect on fire spread.

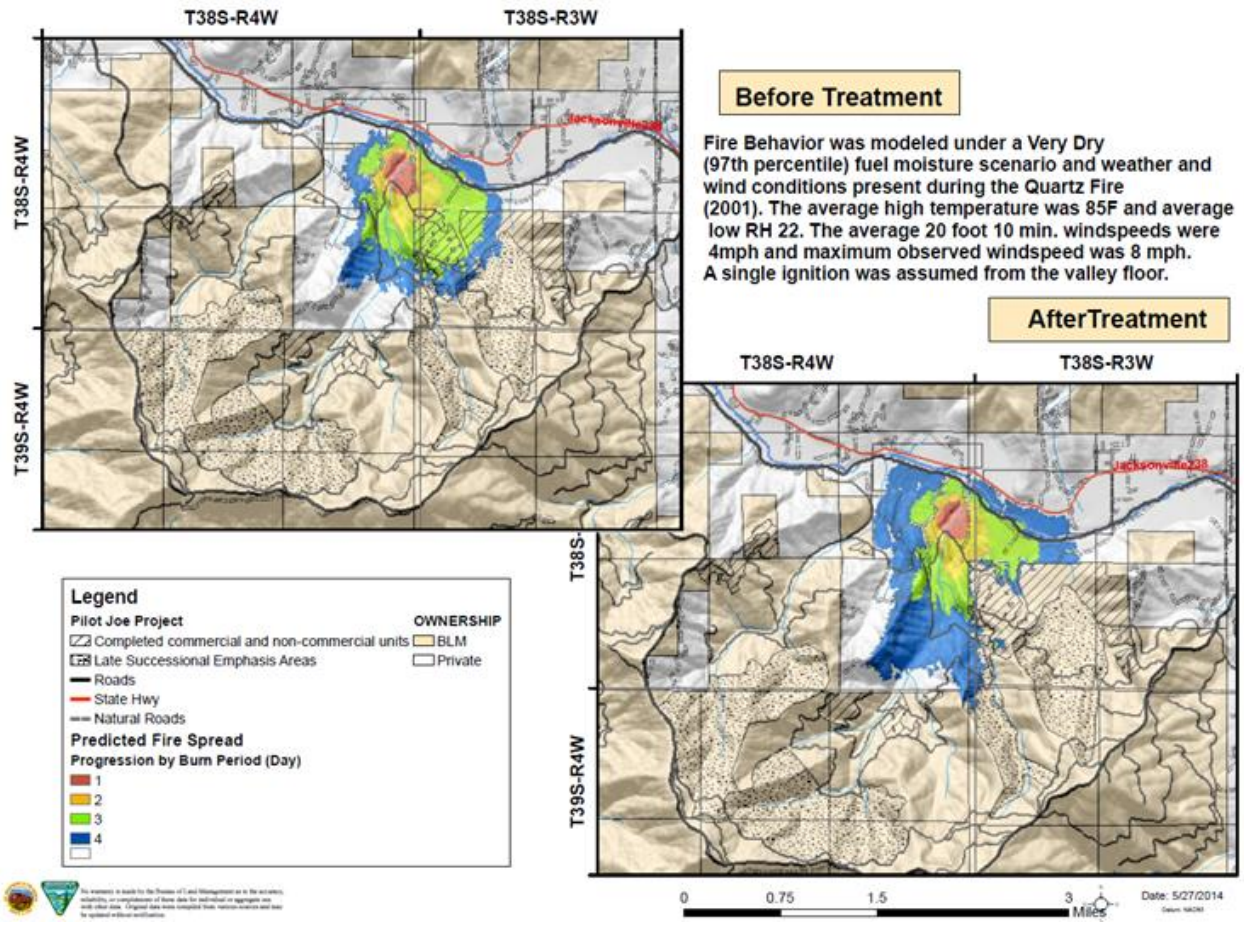

Figure 14. Predicted fire progression before and after completed treatments for weather conditions observed during the Quartz Fire (2001).

Fire Spread — Squires Peak Fire Historic Weather Scenario

The observed average 20 foot 10 minute wind speeds during the Squires Peak Fire were more than twice the velocity of those during the Quartz fire. Not only were wind speeds greater, but the direction was aligned with the topography in this project area. In the pre-treatment landscape, model results predicted that fire would reach edges of all LSEAs by the third and fourth burn period. Fire also burned through the LSEAs located along the major ridgeline.

Under the post-treatment modified landscape, treatments appear to have slowed fire spread, primarily to the LSEA located closest to the valley floor. Modeling scenarios predicted that it would take several days for the fire to reach the remaining LSEAs, and treatments had a minimal effect on fire spread to these areas.

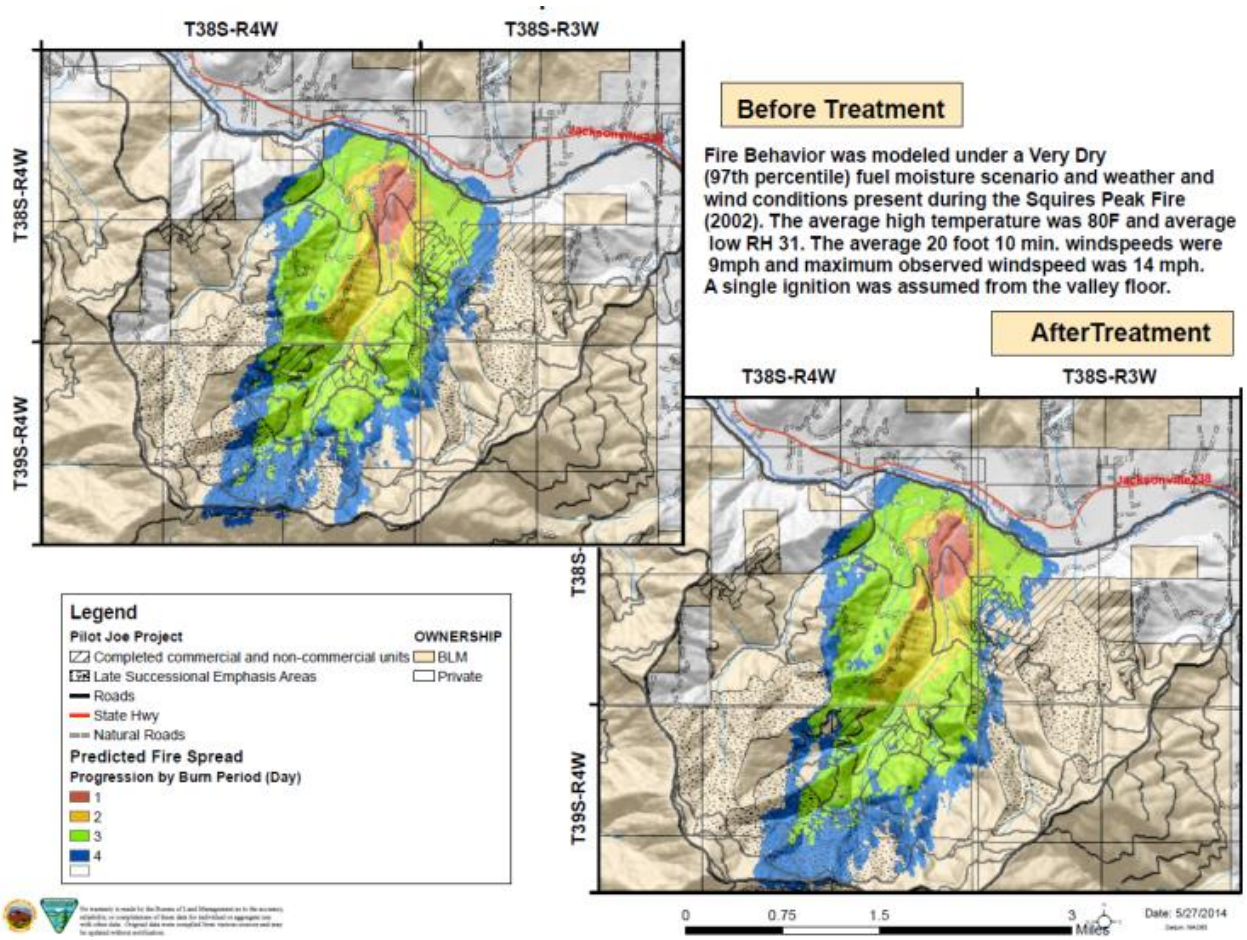

Figure 15. Predicted fire progression before and after treatments for weather conditions observed during the Squires Peak fire (2002).

Conclusions

Similar to the stand level fire behavior predictions, wind speeds in combination with directional alignment with topographic features, heavily influenced the predicted fire spread. Under all scenarios (before/after treatment and two weather conditions) modeling predicted that fire would not spread to any LSEA until the third or fourth burn period. The treatments appear to have slowed fire spread to the LSEA located closest to the valley floor for both weather scenarios. Spread models predicted that it would take several days for the fire to reach the remaining

LSEAs and treatments had minimal effect on fire spread to these areas. These results do not indicate the predicted fire type in the LSEAs or adjacent areas.

Objective 4: Economic Summary Report

Generate jobs and support regional manufacturing infrastructure

Indicators:

- Board feet harvested
- Jobs
- Market utilization
- Efficiencies

Introduction

Forest management in Southwest Oregon has long been identified as a cultural and economic backbone of the region. Recognizing this historic role, contemporary expectations and existing legislation (including the federal O&C Act which mandates a portion of Bureau of Land Management harvest revenues be provided to support counties of project origin) continue to prioritize the role of forests in contributing to regional economic well-being. The Middle Applegate Pilot established the generation of jobs and support of regional manufacturing infrastructure as a project objective. Indicators chosen to help assess and understand how well the Objective was met include board feet harvested, jobs created or maintained, what markets benefitted or were accessed in utilization of material and what improvements in planning and implementation throughout the process could be identified in hopes of gaining future efficiencies.

Several caveats are worth measuring. The Pilot Joe Timber sale was small, dispersed and implemented over several seasons. While this complicates projecting findings or expectations to future sales and larger scale, it does highlight conditions nonetheless common to the checker-boarded landscape of SW Oregon.

Also, while Objective 4 is approached through quantification of on-the ground and manufacturing jobs and outputs as primary indicators, additional outcomes of management and utilization should be noted. These include the training and employment of a skilled workforce and the maintenance of a manufacturing infrastructure. Without skilled workers and existing manufacturing capacity, the capacity for future forest restoration and management is placed at risk, with negative consequences for long-term forest health and the reduced the risk of fire to rural communities.

Results

The Pilot Joe Timber Sale provided employment along a trajectory that included project development, design, implementation, utilization and monitoring, not all of which is captured in jobs created information in Figure 16. It also generated products, reduced fuel loads and fire risk, provided economic benefits to forestry associated support services, tax-based benefits to government and brought money into the regional economy.

Less quantifiable outcomes can also be cited, including personal and family well-being, skills development and ecosystem benefits.

Indicators:
Board feet harvested: 2,075.65 mbf
Jobs: 22 forest sector jobs created or maintained through commercial harvest
Market utilization: plywood and local firewood
Efficiencies: layout and design; contracting

Figure 16. Results of indicators established by the Multiparty Monitoring team for Objective 4.

Indicators: Board Feet Harvested and Jobs

Pilot Joe generated 2,075.65 mbf of material (primarily Douglas-fir) from commercial harvest on 248 acres, for an average of 8,370 board feet per acre removed. Recent Oregon Forest Resources Institute (OFRI) estimates suggest 1 mmbf of material removed and processed "creates or maintains" 11 forest sector jobs; forest sector employment provides 1 out of 20 jobs in Jackson County (*Oregon Forest Facts & Figures 2013*).

Market Utilization: Plywood

Boise-Cascade utilized the material in the production of veneer, supporting Oregon's role as the largest U.S. producer of plywood, with 24% of the national market. (OFRI, *Oregon Forest Facts & Figures 2013*) Roadside collection of firewood occurred on the project, supplying local collectors and homeowners.

Efficiencies: Layout and Contracting

The need for project efficiencies related to the innovative "skips and gaps" design and layout of the project were highlighted by the contractor. Suggestions relate primarily to earlier and/or more flexible contractor engagement in design and layout.

Stewardship contracting remains an attractive alternative to timber sales and service work in lower per acre volume projects, possibly allowing more total acres to be treated in "goods for services" exchange and generating retained receipts applicable to future projects. Other

integrated contracting strategies may be necessary to efficiently advance future "integrated vegetation management" projects.

Figure 17. Pilot Joe logging crew with former Secretary of Interior Ken Salazar and agency representatives.

Additional perspective on indicators:

Pilot Joe treated 559 total acres. In addition to the 248 acres of commercial thinning that generated some 2 million board feet of material, fuels reduction work was also completed on 532 acres and pre-commercial thinning occurred on 196 acres. Jobs created or maintained through this work has not been captured in the above multiplier (11 jobs per mmbf). Some of the data helpful in estimating jobs in this arena is proprietary; in general, more complicated mechanisms are required to capture the total realm of economic benefits of management.

Also not captured are agency jobs. Bureau of Land Management employees carry the primary workload for planning and tracking forest projects. This labor and associated economic benefits to communities where employees live is an important part of the broader economic picture of federal forest management.

The Ecosystem Workforce Program of the University of Oregon has created a strategy to better capture the broad range and value of forest restoration efforts. The model looks at total project fiscal investments (inputs) and measures outputs in terms of direct, indirect and induced effects. This model appears helpful in gauging return on project investment in relation to economic output more broadly conceived. It is a strategy that suggests itself very helpful in directing future investments in active management and tracking associated economic benefits (Ecosystem Workforce Program, Working Paper #24, *Economic and Employment Impacts of Forest and Watershed Restoration in Oregon*).

As a component of the Pilot Joe project a series of "Learning Conversations" were convened with key contractor, community and agency partners to better understand the complexity of innovative projects like Pilot Joe and capture shared (or not shared) learning to improve future project success. Several of these conversations provide expansive exploration of some of the above topics and are summarized under objective 5, with more information available upon request.

A key perspective gleaned from the conversations is that monitoring efforts would be well served if objectives and indicators were established prior to project implementation. While the Pilot Joe timeline did not allow this convenience and good learning occurred nonetheless, getting ahead of the implementation timeline is advisable.

Objective 5: Pilot Joe Learning Conversations

Gauge public support for pilots

Indicators:

- Public Awareness
- Pilot Community Outreach and Engagement
- Public Concerns

Methods

The Multiparty Monitoring Team sponsored a series of guided conversations to capture diverse participant perspectives about the Pilot, and to inform and improve future project design and implementation. These conversations, in accordance with Objective #5 of the Multi-Party Monitoring team, address the goal stated in the Pilot Joe Environmental Assessment: "*to gauge the degree to which active forest management, with a focus on ecosystem restoration, has a broader base of social acceptance than traditional management practices.*"

Participants included community members engaged in public involvement, agency staff responsible for project design or implementation, and timber industry representatives. Some were recruited by invitation; others through the BLM public contact list. Six conversations were facilitated, recorded, transcribed and summarized. Although the groups differed by affiliation with the project, discussions followed a similar format, focusing on how the project differed from more standard management, whether it was deemed successful, and how the project's innovations might be extended and improved. Specific questions regarding design were developed for agency planners and specialists; issues related to implementation were discussed with the operator and industry representatives, and questions regarding communication and outreach were covered with the community.

Conversations with BLM and other agency staff, the operator and timber industry representatives yielded both substantive affirmations of and concerns about the Pilot process and future projects. Recruitment of community participants was difficult, hampered by what some called "meeting burnout" and a breakdown of communication with the agency regarding a planning oversight in one of the harvest units. The one small community conversation of highly involved and informed participants could not be considered representative and does not necessary 'speak' for the community perspective. Similarly, efforts to recruit environmental group constituents were not as successful as hoped. That said, all conversations affirmed the success of the Project, both its outcome and process. Below is a selected summary of notable perspectives across all groups.

Results

PILOT WAS A SUCCESS: PROJECT GOALS WERE MET

One of the original premises stated up front in the EA; this was a demonstration of an approach. So I think it was a great demonstration, it was a rapidly developed demonstration, and we tried to get that out so we could have these conversations with a broader audience, and get a lot of interest in it. We succeeded definitely - and we've got something to show on the ground that people can look at now (Staff).

Ecological - S*hort term, yeah; long term, we'll see (Staff). R*educed fuel and increased survival of drought-tolerant trees; reduced risk to LSEA areas; left skips and made gaps (created openings); thinned to address fire suppression and enhance structural component with benefit to adapted species, including grasses and forbs.

It's kind of what I had envisioned. It looks great to me. I'm sort of predisposed to like it, but I think it looks great. Time will tell, I guess. I think part of our challenge is figuring out how to relate the stand structure to the ecological effects on the owl, and you know, all the stuff we talked about: the birds, butterflies, etc. (Monitoring Team)

What I've seen looks great. And hopefully all the diversity will just keep improving: the gaps that are there, the understory species diversity - I would assume is only just going to increase. And the crown fire issue has definitely been mitigated. It looks good (Monitoring).

Economic - *Economically if our goal was to produce a commercially viable timber sale, we did that. On face value, 1.5 million board feet. And I think that's fairly successful in that it employs some local people, sends some wood to the mills locally, so to that end, if that was the economic goal, I'd say we succeeded (Staff).* The Pilot created jobs, provided wood to mills, firewood permits, receipts to county, competitive bidding. Compared to earlier, low volume, density management sales (and expensive logging, e.g., helicopter), Pilot was attractive because it yielded more volume, and commercial sized trees. *And the pilot, from what I saw when we were appraising the sale, allowed us to take some larger trees and a little bit more volume to the acre. So I thought that was positive (Industry).*

I think it's a positive project from an economic standpoint in the sense that it is not a subsidized, I mean I don't know what the ultimate bottom line is, but at least there's a timber sale coming out of it, and to me the reality is that projects on public land are going to have to start paying (Monitoring). It's definitely opened up that conversation about how to more efficiently implement things on the ground so that they are more cost effective from within the agency (Monitoring).

Multiple Benefits - *Well that's probably one of the most important parts of the project, its being beneficial to everybody. Not just the big timber company, or the logger, or somebody that wants to see these ecological goals met, even the public that wants to heat their homes, they see some benefit from a project like this. It helps everybody (Staff).* This was a goal stressed by many and seen as important value of the project.

Demonstrate Restoration Principles and 'Active Forestry' - *I've been doing politically correct logging for years, and I've seen a lot of changes, we've done a lot of different things to try to make the changes when they didn't really make any sense to me. But my priorities have*

changed. I started working in the woods when I was about 14. I looked at it as an opportunity to try to show what could be done. I have lots of equipment and we can do almost anything anybody wants within reason. And it's really important to me that if this succeeds, we do more (Contractor).

It was just a real difference of a willingness of a particular operator to meet the objectives of the project, versus some other folks who were kind of more of a business operational kind of thing and didn't really see some of the other benefits that could be achieved (Staff). Contractor supported project goals and approach, was willing to work with the public and demonstrate harvesting methods.

Monitoring is important to this demonstration project – *I think that's a key component to whether we will be successful as we continue on (Staff). P*eople not only want to see impacts on the ground, they want to know what questions are being asked. Some ID team members were interested in contributing questions to multi-party monitoring team; others were willing to provide information but don't see themselves playing an active role in monitoring.

Social Acceptance - *Tolerance is difficult to measure and anticipate –may not be related to ecological outcomes, which are also difficult to measure at this early date (Staff).* Although many reported increased social acceptance, understanding and trust in the agencies, some discussion revolved around difficulty of pleasing those staunch supporters of views at the ends of the public values spectrum and a sense some just don't support harvesting. Although the professors brought new terminology and approach, such as restoration, there is some disagreement about what they mean, whether they are appropriate for returning to local historical conditions, what those conditions were, and how to assess the outcomes. Short term impacts of logging operation can be harsh and difficult for some people to see. Support of environmental groups is seen as precarious.

I've heard , in most areas, that most people are pretty happy except for the famous trees [Unit 26 1A], *and I know what I can see from the road, which compared to some of the other things and the clear cuts I've seen, feels a lot more positive (Community).*

I wonder if there are scales of understanding and acceptance that we'll benefit from in terms that we're seeing a lot of people, but ...the general population isn't the limiting factor, it's usually a few people. We could convince 99% that we've done a good job in analysis ecologically, socially, and everything but we haven't done anything about the limiting factor. So I'm not sure where we'll get (Monitoring).

All conversation participants affirmed the Pilot's success and reasons were often revolved around its departure from tradition.

PILOT JOE DIFFERS FROM TRADITIONAL PROJECTS

Planning Process -- *The process is what stood out to me as the most different (Staff).*

- Integration – *A little more integration -- brought some other values into the project design (Staff).*
    - Unlike a traditional timber sale when units are designed and then handed to specialists for analysis and reaction, Pilot Joe began with dry forest restoration principles and everyone worked together to meet them.
    - Franklin and Johnson principles and owl concerns guided creation of LSEAs, requiring some potential units to be taken off the table. A little tension between

timber and other values, but 'ologists felt their concerns were heard and timber people felt they were allowed to be creative and flexible in meeting principles.
    - *So we felt like we had to be creative and put something out there that we were going to be judged, for sure, but we had these guiding principles, and that was it. Everything else was up to us.*
- Coordination - *Our internal coordination has grown leaps and bounds (Staff).*
    - Blending units allows the final project to meet multiple objectives and to be of higher quality. Concerns were met as they came up, rather than waiting until specialists and engineers were brought in. *That involvement right there just made the quality better (Staff).*
- Communication - *And BLM's attempts to communicate have been fantastic* (Community). *I think the good thing that's come out of all these pilots … more communication among groups (Staff). I really liked BLM's attempts at communication. We can all do better, but I really liked them reaching out (Community).*
    - Groups used to working independently started to communicate with one another and the regulatory agencies. Specialists were able to see how ecosystem objectives might afford some overall protection for their interests/species.
    - *I think it's helped though because I'm already looking for that coordination …it's helped me to learn to do that- to go approach them on information and work with them more (Staff).*
- Collaboration and integration - *For me, personally, it was a much more enjoyable project to work on because there was more collaboration, there was more emphasis on other values besides just a target (Staff).*
- Internal collaboration: *I think the people that make up the ID team feel like they are successful if they are all invested in the project. And you don't get that if you're handed a project and told, 'analyze this, here's our project' (Staff).*
    - External collaboration: *And it was refreshing to have other elements present at the ID team and the collaboration that occurred; it really moderated things a little bit in a refreshing way (Staff).* Variety of viewpoints brought "checks and balances." BLM staff and community noted the importance of having a community member on the ID team. Staff felt it was a learning experience for community members to see thinking that goes into a project, and tradeoffs required. *That's a good thing. I think it helped people understand how much work the ID team is and how complicated that process is itself (Monitoring Team). Somebody needs to be there to ask the hard questions (Community). People know him and trust him (Community).*

The Professors – *I think that was a key thing; that was really the selling point (Staff). They already had the ear of the politicians and I think that really helped us (Monitoring Team). I think things occurred on this project because of the two Drs. that might not have occurred had they not been here (Community).* Professors Franklin and Johnson brought:

- Political standing and legitimacy both in and outside region. *Having it come from a different person's mouth than a federal agency. … to have someone there who's so well-known both in the scientific world and then also in the political realm, it's nice to have that support (Staff).*
- A new framework and guiding principles. *They had general principles that everyone could agree upon (Community). You could probably get any of the silviculturalists from the BLM and FS that know specifically more, but they [professors] had these*

general principles that are easier to work with (Monitoring). Staff appreciated learning that came from the framework which was broad enough for flexibility in application; the staff had to be creative and apply new tools. *I felt I learned a lot (Staff).*

- Ability to communicate and build community trust. Community liked that the agencies heard and responded to the professors' ideas. The perceived neutrality of the professors allowed them to state *the facts as they knew them"* without being *"argumentative and defensive. I appreciated their input and willingness to communicate with the community (Community).*
- Flexibility. *There's not just one way to leave a stand that it's going to perform well. And maybe that was not explicit, but it was definitely implicit that a lot of things are OK, and I appreciate that. And I think that [presentations by Professors] shows people they're thinking about these things and that there's learning opportunities. (Monitoring team) ... spent ½ a day out there with the 2 profs, very candid conversation, and what they envisioned, and what we have, really aren't that far apart except how we got there is the problem. They really liked a lot of things we did. They're not near as hung up on every little thing being precise as the BLM (Contractor).*

Ecological Principles – *I saw more ecological principles implemented here than I have in a lot of the projects that the agency has done. So I think it is in the right direction. I don't think we're there completely yet (Community).*

I was particularly impressed with the planning that went into the spotted owls, LSEAs. I thought they did a really good job with the owl data that they had (Staff). Mapping and analysis involved a more functional approach rather than owl nest circles, employed new analytical tools and consulted US Fish and Wildlife up front. *...historically it was just so easy to put in these little round circles but they didn't really relate to the actual habitat that these critters were in so I think that the agency has done a really much better job in identifying that habitat rather than just the owl circles that were historically done (Public).*

Landscape planning of the project around the LSEAs with the owls, you know Jason delved into that data and not only just looked at the owl circle nest patch but looked at the owl usage of the landscape and designed the LSEAs around it and then treatments were designed around those to offer some kind of protection. And that was a little bit different than recent projects have been planned at BLM. And you know, the USFWS were really supportive of that planning strategy and on board with that so (Monitoring).

Balanced Approach -- Ecological goals, but also optimizing growth and yield. *There's more effort to balance the two, definitely a lot more conversations built around when you make those compromises or not (Staff). On the industry side [when they were out on field trips] I kinda got the impression that there was an 'oh, we could work with this', you know there was enough volume coming out of here that it's actually economically viable (Monitoring).*

Landscape approach – some patches, some clearing; retaining old trees and hardwoods. *The big difference is saving the hardwoods. We're not really used to hardwoods in the way of growing things we want, so get rid of 'em. That was probably the biggest thing. The actual logging part of it, once we got into that, isn't that much different than things we've done in the*

past. … they [professors] don't want to go out there and do this one thing over the broad area (Contractor)

Public involvement - *I think there was success in that we got enough people involved to be interested and to trust in us enough to see how it would play out.* People were on board for demonstration, shared their viewpoints but also listened and were open to seeing the bigger picture. Skilled BLM were able to communicate with public and bridge perspectives. *And Pilot Joe, more than any project I've ever been involved with, made an effort to involve the community and outreach, to anybody that was interested, more so than I've ever seen the BLM do (Staff). There was ample opportunity provided for people to learn about how to get involved and that was good (Monitoring). I appreciated the field trips, went on every one but one and I've been to all the meetings, to my knowledge (Community).*

Conferences, public meetings, field trips, and a community member on the ID team created opportunities to share principles and plans to a wider variety of people, including county commissioners and Congressional staffers. Skilled BLM staff were able to communicate and bridge perspectives, people were seen as sharing viewpoints, listening and learning. Benefits reported included increased trust. *And I think it helped, I think there was a lot of good conversation that happened at those field trips that sort of made the planning process smoother (Monitoring).*

And because of that [public involvement] I think in the future we're having a lot more eyes focused on us, and interested, and willing to actually listen and see the whole picture, and I think that's the key. Rather than just coming to the table with what they believe, they're able to be a little more open to seeing the bigger picture instead of just their own perspective, hopefully (Staff).

More field trips require a lot of time and commitment (not to be underestimated) but most felt outcomes are worth it. *We had a lot more field trips than we normally do with this planning process. From local interested community members, BLM folks, and then even folks outside the region and the Washington office (Staff). I felt the public attendance kind of fell off a little - those meetings are hard to get to, particularly if they're held in the middle of the week (Community). I know it's got to be a drain on the agencies, on the capacity of groups, the time it takes for core people, that stuff is not to be downplayed, but they just seemed essential at the same time (Monitoring).*

It is a relationship- building opportunity when you're out there in the field with people and I think that's really important and very hard to put your finger on how or measure it, but I think it's important (Monitoring).

Demonstration Project – important that the job done was exemplary, even if not very profitable. *My goal is I want to demonstrate, I want to make sure we could do a good, viable logging job that the BLM and everybody else could go out and look at and say, well this is what it looks like, we can do some more of this. … Well I look at it as an investment, b/c what I want to see, I'm a short timer, but I consider land management, the logging, the whole bit as part of my culture and heritage and that's been taken away by some people's opinions. I wanted to look at it as an investment, as something we could live with, I didn't want to do anything really special because it has to be practical and viable. We could go out here, and we could do a job to the public, if you will, I can hopefully make a little bit of money, return on my investment, keep people busy, and that was my main goal. (Contractor)*

Avoided controversial practices - *I really liked the stuff left out on Pilot Joe. The LSEAs, the big trees, staying out of the owl habitat, no new roads, wonderful (Community).* Both BLM and community members agreed that avoiding controversial issues helped gain public support, and community appreciated that no roads were built. No roads was more problematic for some BLM staff.

Not that different, according to a few - *I think what we were doing and what we proposed for the pilot was really similar to what we've already been doing we just maybe didn't spell it out quite the same in the process or in our EAs (Staff).* Some felt it wasn't all that much different from other projects in terms of ecological goals, pubic pressure, project outcomes, or contracting mechanisms. Just a few "tweaks" from normal prescriptions, operations and outcomes – and professors' stamp of approval. *Not a departure or anything but a sort of natural evolution of the types of projects that have been going on that have been sort of integrating ecological considerations with trying to blend it with some economics (Monitoring).*

CONCERNS

From community

- **Opening up canopy will create a fuel problem in ten years**. *I recognize we need to get logs out of the woods, but overall we're trading one fuel problem for another ... we really need funds to attack the next fuel problem ten years from now that is probably going to happen on much of this*.
- *That's been the thing that I've noticed from the road, is that it's like, wow, I know what that does, and there's some areas behind us where the canopy is gone, 2 things have happened: either it's become a desert up there and nothing is growing, or it just moves in with the brush and I think neither of those are good, and that is a huge concern.*
- **Implementation could have been better.** Too much brush removal by Grayback and not enough hardwoods retained. *...ended up being everything, it cleaned up better than I wanted to see it.* Concerns about large trees removed in Unit 26 1A.
- **Still some information gaps**, especially regarding necessity of thinning old trees. There are still unknowns regarding historical conditions. *I have a hard time believing some of these areas up in these high elevations didn't always have these huge firs that were fairly close together with a covered canopy.*
- *They [professors] have a sense that the historical forests were much more open, but I don't think that's proven, I don't think that anybody actually knows that. I have a hard time believing some of these areas up in these high elevations didn't always have these huge firs that were fairly close together with a covered canopy.*
- *It's really hard to debate what the landscape looked like, and the jury's still out.*
- **Dry forests should have a different criteria for "old growth."** *The 150 year limit is inappropriate. I mean the average stands that we have in these forests here are probably 100-120 years and so 150 is outside the range normally, and that basically means carte blanche for everything.*
- **Monitoring needs more funding**. *We're doing this with a ridiculously low amount of money for monitoring. It's ridiculous. And we can't, we can't do adaptive management without monitoring. And I like the concept of the multiparty monitoring rather than just the agency monitoring.*
- **Breakdown in honesty and transparency**. *That was like, over and over in the beginning throughout, 'we're going to be transparent,' that word was like a big*

flashing neon sign, but then it wasn't there. A knowledgeable citizen was taken off the ID team when an issue arose. *Luke should've been invited to sit in on Pilot Thompson. That was really great getting his feedback from being on the ID team. They had a mole amongst them and they'd never had that happen before and he was honest about what was going on, and then that little rift happened….*

- **Public interest has waned**. People are busy, they find it hard to make meetings and the expense of taking off work. People are turned off by the "two tree issue" [Unit 26 1A] or could be that people are less concerned about the project. ...*there was a massive turn out back when we had that, it was really kind of great to see how many community members showed up, and then the meetings just dwindled down to almost nothing over a pretty short period of time.*
- **Pilot Joe lacked issues likely to arise in more populated areas with many neighbors.** *Well, keep in mind, too, Pilot Joe didn't have a lot of houses or homes affected by it. It's south of the river, it's very little private land abutting it, so it didn't have that kind of impact. And it was also much smaller. So it got a lot of interest, but it didn't have that community aspect.*
- **Handling of issues -** It was more than just mistakenly cutting two trees. *... I feel some frustration with the process of just hearing it called 'the two tree issue.' Titling it demeans it, it diminishes the whole way that the agency handled it. And for me that was largely the problem.*
- There was not adequate communication; people felt they were not being heard. *...it isn't even the trees themselves, it's the general feeling around it.* It could have been a learning opportunity if the agency had responded to concerns with honesty and transparency, rather than defensiveness. *OK, mistakes get made ... why are we trying to have a learning process if the first problem that happens is met with defensiveness and accusations?*

From contractor and industry

- **No flexibility in sale administration.** Too difficult to implement the Professor's new approach – had to argue through everything with the BLM at the beginning. In the end, the outcome and the vision were not that far apart, *but how we got there is the problem. Everybody has heard me say that you have to do something different out here, this is the first time, and yet we have a contract that we're locked into and there should've been a lot more flexibility.*
- Some of the sale administrators are overly cautious or not confident or flexible enough to allow contractor to make choices. *I said I need specific priorities on what you want left in doing the corridors, so we sat down and agreed on an order of priority, and so we go out and start doing corridors and immediately we start running into problems because I had made choices, and the sale administrator had to go back and ask permission to do whatever it was we were doing.*
- *It's my opinion, of having worked with the different resource areas, that some of the sale administrators are probably given more authority and the responsibility to make decisions, and some of them aren't.*
- **Skips and gaps created complications**; can meet ecological goals without them (and would have been more efficient and economical without them). *...because there's so much riparian, plants, owls, all kinds of things, I see no reason why we need a skip in a unit we're treating, because there's 1,000s of acres that are basically huge skips,*

that we will never treat for different reasons, and it complicates the management of that unit, especially if you have cable logging, when you're trying to work around a skip.

- Negotiations over skips took a lot of time and contractors' decision-making authority unclear. *One thing we read into was for the most part we were told the skips, they want them there. They didn't really care too much where they were, they just want a certain area they want to test for a variety of reasons. Ok, I'm cool with that. Except sometimes you need to fudge them over or we need to go through them and change them and that was a big hassle.*
- Inflexible restrictions didn't allow corridors through skips, when needed, and some marked timber was left standing because couldn't reach it. *It just made it a lot more difficult. One of the things that cost us a lot …is the fact that it took, on the big unit, on the long corridors, it would take us 2 days to get a corridor around, and that's not very efficient for us because I don't get paid very well but my side rod gets paid pretty well, but it takes, that's probably 4x longer than normal, because we have to leave the big pine, the old growth hardwood, the old growth fir, stay out of the skips, and in places it became a concern because we had to use lift trees and have table trees behind them. Just that part of it took a lot longer than we anticipated, and not for any real good reason I don't think.*
- Unable to get all of the timber out due to safety concerns and hardwoods. A lot of hardwoods in the skips, tricky to fall, or tangled up with timber. *You walk away from 'em. The cutter's instructions were if it was a large oak or madrone and it had small trees growing through it, they were to just walk away and leave 'em. Don't try. And if they were on the smaller hardwoods, they were told that rather than fall through them, to cut them first. Well actually that wasn't in the contract. Yeah, that was the agreement we came to. And they wanted certain ones, and they told us what they wanted left, the ones that are important, or whatever, but you know, we had to leave some trees.*
- **Not sustainable -** ecologically, because won't get enough regeneration; economically, because of inordinate amount of planning time required. *I just think that you maybe could've opened it up more and planted more, but if you're gonna come back, if you're gonna preserve old growth you kinda have to do what we did out there and if you're gonna sustain a forest over a long time period then you need to do some things different…*the time and effort put in by agencies, agency people, and then just everybody involved, it just, that makes it not sustainable
- Remote, small units not economically feasible. *The small units add a lot to my cost, and I don't think we really accomplish anything by doing it either. I mean you look at the overall, what I think people envisioned, particularly after talking to them, by doing those small choppy units we didn't really do anything, we didn't really accomplish anything at all. I mean we harvested the trees, we got some little areas open, but you could've gone on further and improved the quality on your restoration*
- **Slash -** can't burn (smoke management) and it's expensive to remove. *One of the problems I had with the thing, and there's been a lot of discussion, is the slash implications out there. And in places there's a lot of small material that's too small, not economical to yard and what are we gonna do with it?*

From monitoring team

- **Principles could become hard side-board rules, eclipsing adaptive management**. *I don't have a problem with that recommendation but a lot of this is just very well educated guess work. Sometimes I think there's a tendency to take what the "oracles" say, and these guys are the oracles, what they say that becomes the magic, you know, ten percent, these numbers, I hear them thrown around, and it's just, those are just educated guess work and so that's a concern in general, I guess.*
- **Might not be sustainable**. *It seems like there's a need to focus on how we can better efficiently do business.* Analysis, planning, etc. take larger budgets than can be expected; may be feasible at larger scale. *Maybe it was not at a sustainable level, I mean, you couldn't do this for every project. This is the first project that I can think of that really gives explicit recognition to this spatial complexity stuff that we've all been talking about.*

From agency staff

- **Short time line -** *We're always behind the curve and the Pilot was no exception to that.* Unrealistic time lines didn't allow for all the integration that could have taken place. Sale was taken off the shelf **- …***this is what we had to work with, so it was let's do the best with what we have to work with.*
- **Scale sale -** *We didn't have the time to have our cruisers go over the entire sale*. Scale sale was more time consuming, can be less accurate and leave more woody debris.
- **Collaboration and coordination takes time -** *The field visits and stuff are great. I don't think they really held my field work up, but just the fact that there's more communication you're going to have to be in the office and be around people more ... you can't be out in the woods 5 days/week like you want to be.* Although staff felt that coordination between specialists was beneficial, it did detract from their valuable time in the woods.
- **Skips and Gaps difficult operationally -** *Some people like myself, we would go try to identify a skip and put it in, and L would do the same thing, and then we'd figure out it wouldn't work for logging systems, so it kind of brought us together, to where we would just go out and do them together.* Staff were able to develop a process that kept intent of skips but was flexible, e.g., that worked for cable corridors; however, this creates inevitable uncertainty at the planning stage.
- **Avoiding controversial actions, such as roads, limited options -** *Any time we propose new roads, especially permanent new roads, it's almost a no-go, it's like a hornet's nest, it's like whacking a hornet's nest with a stick.* Some staff felt the Pilot could have been more successful if stands in some remote and riparian areas had been accessible; some hope constraints could be overcome in future pilots.
- **Budget and staff cuts -** *…limitations in terms of workload which makes it difficult and I think that has to be acknowledged and understood.* While all seem to recognize the inevitability of limited support, the strains of increased workload and its toll on quality need to be communicated, although it's difficult, given BLM culture. Inefficiencies such as end of the year fiscal spending and beginning of the year lack of budgets exacerbate these frustrations, as do what are considered to be archaic performance measures.
- **Some public still polarized** - *Well that doesn't satisfy the focus of somebody who says, timber only, forget about all that other crap. Nor does it satisfy the very hard core environmental people because you take stuff off the table and then it's just the*

next fruit, whatever you've removed, we don't care about that we're just going to go down the list. Frustration was expressed regarding positions at both extremes that will resist these pilots because they are either not all timber or not all conservation. Some feel there is a segment of the public that will never support timber sales, no matter what the prescription and how many sidebars.

SUGGESTIONS AND RECOMMENDATIONS

From community

- **Training program for fallers to understand prescription and objectives --** *I would like to see BLM implement some sort of training program for the fallers.* Contracts need to be changed to reflect the work, rather than pay by the amount felled; paying by the hour could reward caution and safety.
- **Consider corridors when planning gaps** -- "Those corridors need to be counted."
- **Recognize uniqueness of SW Oregon dry forests --** *I think the measuring stick we are using is made some place else. It's made north of Roseburg, it's made on the Willamette, it's made in Eastern Oregon where it's a much different landscape and I think there are expectations of this landscape providing more timber volume than we are capable of producing because of the steepness of the landscape that we are in.*
- **Address counties' resistance to change --** Get county commissioners out on the landscape to see what's happening and get them to support service contracting. *I think that the BLM doesn't necessarily address that funds need to be put to the forest in order to maintain it, not funds need to be taken out of the forest in order to maintain it.*
- **Use monitoring data for adaptive management --** *We're learning a lot, we have a lot of data, the big question is once we get that data, it's critically important the agencies take that data and implement it as they move forward in new projects. If they don't, we're just going to keep rebuilding the same old wheel over and over again.*
- **When an issue comes up, stop and assess** -- *There should be a place to put on the brakes when part way through the process, even after the community has given it their blessing, if something comes up that there needs to be [addressed].*
- **Use lessons learned** (communication, design, goals and values) from Pilot Joe to avoid future litigation. *And the bottom line is they pretty much shut down the whole damn agency to respond to a legal challenge. Design something that doesn't get a legal challenge to begin with.*
- **Diameter limits along with other considerations** (e.g., old growth trees that don't reach diameter limit; legacy trees) **could help to ease public concern** on the issue of old growth/legacy trees being cut. *I mean I feel like with diameter limits, Oh my God, the community would go [sigh of relief].*
- *So I'm fearful about the diameter limit [as was another] but the beautiful part is that it's correct, if you're saying, well that's at a minimum, and if we suspect it's over 150 years we're also going to save it.*

From contractor and industry

- **Have clear goals and objectives, and flexibility in meeting them.** In layout, provide priorities and criteria, but for increased efficiency, allow contractor some flexibility. *If you had an experienced logging engineer that could do those things and*

think about how you're going to do it; run the corridors first, put the units around it, then go see what you can do.

- *And some flexibility, when we're doing corridors and things, some flexibility to move a stay-out area around a little bit, unless there's some specific thing that's really important.*
- **Better communication to clarify rationale for restrictions -** *And nobody could ever tell me why, why we were doing things.... Because there were places out there we could kind of only go one way, and I don't see, unless there's some very specific thing out there that's really important, then yeah, we'll avoid it, but if we're just out there having skips because we want to leave areas untouched, I don't know why we can't move them around.*
- **Contract language that allows for current needs and market, such as a way to capitalize on economic and ecological benefits of biomass -** *some the stuff that we left on the ground out there, there's no language in the contract, and we ran into that situation on that first unit we had all those corridors come together, we convinced people to let us. I think Boise bought it, but we hauled 2 loads, about 50 some odd tons of pulp* [non merchantable biomass] *off of there, rather than making great big huge piles that are going to dribble down the hill. Well on the rest of the unit we couldn't haul anymore out because the paperwork's too cumbersome to worry about loading this stuff out. The wood cutters loved it but I just thought it's rather ironic that we can't do the paperwork to get rid of the stuff.*
- **Written regulations need to be ground-truthed** – enforcers need to get out on the ground to verify whether conditions warrant restrictions. *Some people that I don't think ever got out there to really understand what was happening. It was a very dry operating season, and they just had some language – 'we can't do this, can't do this, can't do this' but it wasn't based on real world conditions, it was based on anticipated conditions which never occurred. Well it didn't, and that was one of my concerns because Boise paid me to put additional rock on the road and one of my goals was to prove that winter haul, or out of season haul, [can be done and meet regulations] and people would arbitrarily tell us that we couldn't work without getting out of the cubicle.*
- **Move to landscape scale to support industry.** *It was commercially viable timber, it was good timber...but in the big scheme of things, that was one of the 2 mills here, probably one week's worth of run. So if we're going to do a better job on these pilots, we need to go on a much larger scale. ...Plus little projects like that do little to the landscape. We need to treat it on a landscape size, you know, do an entire drainage, so if there is a catastrophic event comes in there, insects, disease, or wildfire, you've got your trees not just touching each other so it will just spread, spread, spread.*
- **Extend operating season.** *The mill needs logs year round. And I can't deck enough logs in a 4 month operating season to keep the mill running year round. I've got to have logs through the rainy season. And if you only allow me to work just in June, July, Aug, Sept, I'm going to pay a lot less for your logs if I can get logs in the winter.*
- *Yeah one thing about the short season, we can do a better job in selective or thinning if we're working in the winter when the bark is tight, because the trees will take a lot more abuse than they do when the bark is, because the bark comes off real easy when the saps running really hard.*
- **Mark leave trees or use Designation by Description.** Marking leave trees gets a better job done and a better outcome for all involved. *Yes, I much prefer leave tree*

mark. I've done a lot myself both ways, definitely as a purchaser I prefer leave tree mark and as a forester I preferred leave tree mark. Leave tree mark gives a better log to the mill, it seems like on more volume per acre, even with the same prescription, and the reason is I think just generally sometimes people are lazy, and if they're ITM [Individual Tree Mark], and there's a tree up there, it's like, I'm not going to walk up there. Where if it's leave tree mark, you're concentrating on the trees that are going to be left, which is most important. And the people that are out there marking, in the back of their mind they know that and so they're going to go mark those trees that need to be left. I think it's a much better job.

- *I think we can get an even better job with Designation by Description. And as a purchaser I get the best out of a D by D because say when you have an ITM marker out there they're only marking the suppressed, and that's about it. And if they're LTM they're leaving the Dominants and Co Dominants so you get to take the Intermediate and the Suppressed, and D by D, if there's 2 Co Dominants there and they're only 10 feet apart, I get one of those, which really makes a big difference to us.*
- **Have one person responsible and accountable for boundaries, trees, painting, posting, etc.** *We got to*
- *talking to people, and one person puts the unit boundaries in, somebody else picks part of the trees, and another person picks another part of 'em, and somebody actually does the painting and posting, etc. and I asked, well, why do you spend so much time with all these people running back and forth all over the ground? You know, if one person came out and did this, then you can go out there and hold him accountable if he's marked the wrong trees or doesn't meet your specs. There's too many people doing too many repetitive motions. And nobody looks at the whole project; everybody's doing their own little thing.*
- **Get 'ologists and sale contractors to work together towards same goals.** *All of the 'ologists need to get together to be working toward a common goal because it's my opinion in this building they're not… And that's the reason these pilot projects won't work in the long term basis is, you've got to get everybody on the same page, working towards common goals.*
- **Involve operator in marking to provide suggestions and increase efficiency.** *We [purchaser and operator] are WAY more efficient at it than they are. I mean, just bottom line. These guys, when they're out there marking, I mean there's an urgency because the yarder is coming in 2 weeks, you know. And they're like, we gotta get this done.*
- **Involve operator when marking skips,** as BLM has done in the past with owls. *So we went out and they designated the critical places they didn't want us in. We went out and ran corridors and marked little gaps… so we did this all in advance, then they came out and marked the timber, tributary to the corridors, and in places we went through and were very careful to leave the dominant trees and remained the canopy closure for the owls, and did all that and they were really happy. So there's lots of things you can do. That we would need to be involved, or you would need to get somebody that's knowledgeable to do that stuff. But if you went out on your skips and you said, OK, this is critical, this has got something we want to save and it's important, we won't touch it.*
- *And the people that did the layout should've, everybody spent time in those units, they yellow marked those units, and when you go out there and all the trees in the unit are*

yellow marked, then why didn't somebody go out there and just flag it off? Save me the time.

- **In designing sale boundaries, consider economic feasibility of harvest** *... on that sale there's a lot of large areas included in the units that we spent some time going through that we didn't do anything at all because it wasn't in any way shape or form economically feasible to chase a few scattered trees.*
- **Provide option of bundling non-merchantable material in the contract if there's a market.** *Never make it mandatory, but have it easily optionable if it works out. Because it's all economics. Right now, you can't get it out of the woods, because they're not paying enough for it.* If there are ecological needs or prescriptions to get this material out*: I think you need to have the latitude when you're doing something like the pilot project, for somebody to go out there immediately after the timber is felled, and make that determination and have that latitude to say that you will pay Boise X dollars to pay me to yard some more of that stuff.*
- *It has to be done before we yard it. And if you want to do some thinning of small material, then you need to mark that and include that, but once again, I have a pick with hand piling and burning and I think the ground doesn't need to be clean, I can give you lots of good reasons why it shouldn't be, in my opinion, but you need to have the latitude to see what we tear down and what's gonna be left ....*
- **Use Scaled Sale or Recovery sale rather than Lump Sum sale.** With lump sales agency would have to buy uncut timber back – recovery sale (aka scaled sale) is more flexible. *For the BLM especially, they would save a lot of money on cruising if they went to All Recovery Sales rather than Lump Sum. Because their Lump Sum sales they need to meet a certain criteria, for sampling error and everything, and so they really spend a lot of time cruising those. Where if they're a recovery sale, they can spend less time cruising and everything gets scaled, and that's what the basis of payment is.*
- **Treat the riparian zones.** Can do it with a lighter touch (see below). *We could've fixed the creek, got the logs outta there with almost no additional road construction and treated the bottom way more economically feasible than we did, and covered the whole area down there because there's other areas that have large, scattered pine there, they're competing with the red, or Douglas fir as a an invasive species in a pine forest, so I'm all for eradicating the Douglas fir.*
- **Allow road access in wet months if erosion mitigation in place.** BLM staff need to come out to site and view conditions and efforts at mitigation. *If you don't like what we're doing, come out, let's talk about it, we'll change.*
- *And the more we can stretch the season out, the more days we can work, the better. The good people we have can go other places can get jobs and even right today. And when you lose that infrastructure then you lose, you know. I think we're pretty good at what we do, and we take pride in that, and I would like to, some of the other people do too, but when you just start only working 6 months a year then people have to start making choices and go do something else.*

From Monitoring Team

- **More integration up front of monitoring with planning** -- I*t would be useful for projects to talk about monitoring during the planning phase, in general.*
- **Apply learning** --*I think it's really useful to collaborate on the project planning*

together with more than just the agency and get community input, so why not collaborate on learning about that implementation together, too?

From Staff

- **More flexibility and integration of stewardship and sales contracting -** *Difficult to provide both contracting methods over the same amount of ground, it's not very efficient. Even though we will meet those objectives, it's just not as efficient as having the same outfit do it, that's what I've seen.*
- **More coordination at the project implementation stage -** *With the skips and gaps in the prescription, we tried to work a lot more with the sale administrator than I have in the past as far as the layout, trying to make sure everything is feasible as designed, then we could actually implement it as we've said on paper.* Important planning concerns overlooked during implementation; disconnect between planning and operations could be bridged with better communication and follow through.
- **Incorporation of other concerns such as invasive species and road decommissioning -** *… not just a forest management, but other chronic problems that we have in the watershed that we should deal with.* Other needs mentioned: weeds and invasive species, road decommissioning, fish passage, sedimentation, and culvert replacement.
- **Continued collaboration and communication -** *Coming up with better ways of communicating, working together, I think we've started to do some of that and I've seen a lot of improvement, but it's just a learning process when you're trying to do things differently and incorporating additional things you need to do….* Agency staff acknowledged that collaboration a work in progress and more communication is required, especially with emphasis on public involvement. Not everyone on ID teams on board with new restoration approach.

STAFF LOOKING AHEAD

It will get more difficult [without the Professors' support], in a sense, socially and politically, but I think the process is going to be more efficient with getting these projects out. You know, we know what we need to do. We know what's in store for us. We can anticipate these challenges.

- **Need larger scale planning.** *I think that we can do a better job if we can take that step back, and look at the landscape and say, this is what needs to happen out here, in these places, and this is why that needs to happen here, and I think that would be a positive step forward.* Begin with a blank slate, watershed-level planning for restoration projects, *stepping back a little even farther to understand what the scale of interactions are*.
- **Further integrate restoration and timber goals.** *Something that we don't talk about enough, but it's inherent in our goals, is that we are actually marrying up some kind of production with this ecological forestry; it's both, we're trying to do restoration of these processes but we're also trying to get products out that the society needs.* There will always be some tension between restoration and volume commitment; large areas could benefit from treatment, but may not help meet targets and budget stream is limited.
- **New forest plan might bring some clarity.** *With the new forest plan coming out, it might bring some more clarity there, but there's always going to be this battle until we have some kind of a plan, internally and externally. Analysis and implementation logistics are getting worked out, but long-term direction needs clarity.*
- **Continue to incorporate good science.** *Just to gain more knowledge and to be able to*

convey that information to folks that don't have that knowledge and to have scientific support for what you're doing out there. Following the lead of Norm and Jerry, find and convey the best information.

It's a cultural shift, you know, it's a paradigm shift and what I try to tell myself is that's just a slow and painful process, it's not going to happen overnight. We've been doing things a certain way for a long time, and it's just going to take maybe efforts like these pilot projects, having the discussion, and hopefully those are the motivation for the change.

Photo Points

Several permanent photo points were established in the spatial heterogeneity plots, non-commercial units, yarder corridors, and commercial units throughout the project. Pre and post photos were also established in FIREMON plots. Photos provide a visual record across multiple phases of project implementation and generate a baseline to identify change over time through repeat photography. Photos provide opportunities to assess project implementation and change over time. They can also provide a tool to build public understanding of the dynamic nature of stand response to active management.

This permanent photo point of a cable yarding corridor was established by the Pilot Joe Multiparty Monitoring Team immediately after completion of the 'finish work.'

The Pilot Joe Multiparty Monitoring Team established this permanent photo point.

Figure 18. Conditions at one of 20 FIREMON plots established one year prior to any treatments (left) and conditions at the same plot immediately following the hand-piling of remaining activity fuels (right).

Monitoring Conclusions

Objective 1. Increase forest and ecosystem resistance and resilience.

Treatment reduced stand density, increased average stand diameter and decreased the proportion of Douglas-fir relative to other species. It also reduced crown fire potential, at least in the short term. These results suggest forest resilience increased, but more and longer term data are needed. In particular, tree vigor and understory species diversity are important elements of ecosystem resilience, but will take time to respond to the altered post-treatment conditions

Objective 2. Increase spatial heterogeneity to benefit biodiversity and species of concern at the stand and landscape scale.

Based on the measured indicators, the results suggest that fine-scale, between stand, and landscape spatial variability increased following treatment. The influence of spatial heterogeneity on biodiversity and species of concern, at both the stand and landscape scale, were either not measured as a part of this monitoring effort, or will take time to respond. For example changes in structural spatial heterogeneity have the potential to strongly influence plant species diversity and contribute towards overall biodiversity over time.

Objective 3. Conserve and improve northern spotted owl habitat through LSEA (late successional emphasis area) design.

Based on the analyzed indicator, risk of fire spread to LSEAs, results indicate that the treatment design may contribute towards the persistence of northern spotted owl habitat on the landscape. Due to limited funding and logistical constraints, the effects of the treatments on northern spotted owl use and reproduction were not monitored.

Objective 4: Generate jobs and support regional manufacturing infrastructure

Based on the measured indicators, the Pilot Joe timber sale provided employment in several phases: project development, design, implementation, utilization and monitoring. It is estimated 22 forest sector jobs were directly provided, as well as additional indirect benefits. Over 2,000 mbf was harvested. It also generated products for local and broader markets, reduced fuel loads and fire risk, provided economic benefit for support services, and tax-based benefits to government.

Objective 5: Gain public support for active management in federal forests

Based upon the six guided conversations meant to capture diverse participant perspectives about the Pilot, to inform future project design and implementation, and to gauge public support for restoration forestry, an array of substantive concerns and recommendations were shared, yet all groups judged the project to be successful both in process and outcomes. The Pilot was different from traditional projects in that the process was more integrative, collaborative and principle-

driven. Particularly appreciated were the credibility and expertise brought by Professors Johnson and Franklin, their emphasis on ecological processes, consideration of community sustainability, and communication with staff and community. All groups attributed the success of the project to public involvement efforts by the agency, although some community members expressed concern about the breach of trust created by the treatment of Unit 26-1A. All conversations expressed a desire to see planning and implementation of restoration projects on a larger scale, although there is little consensus as to how to introduce more controversial practices, such as road building and harvesting large trees.

Overall, results of the monitoring to date suggest that the Pilot project is meeting its stated objectives.

Observations and Recommendations

- Monitoring to date provides a snapshot of pre- and immediate post-treatment conditions. While these results are interesting, longer term responses will be very important to evaluate. For example, tree vigor, understory species diversity, tree regeneration and fire behavior will all likely change after 5 or 10 years.
- With respect to ecological monitoring, the data generated focused primarily on vegetation and physical characteristics of the stands. Due to lack of time and funding we were unable to effectively monitor spotted owl demographics, bird species composition, and other indicators of treatment effects. This kind of monitoring is often of the most interest to stakeholders, provides the best information about ecological function, but is also the hardest to accomplish.
- Initial stakeholder (public, community, and agency) was highest initially and declined over time as individuals moved on to other projects and concerns. Sustaining interest and resources for monitoring over time is challenging.
- Better integration and collaboration with ID team could improve communication and monitoring efforts.
- Based on learning conversations, there is a desire for restoration management at a landscape scale, but not without some concerns and recommendations for improvement
- Transparency and trust are critical to public support for federal management
- Long-term and ecological function monitoring and monitoring of social acceptance are needed so that management can be informed and adaptive to achieve the best results

For further information on the pilots and the Multiparty Monitoring, please visit the BLM website at: *http://www.blm.gov/or/districts/medford/forestrypilot/pilot-projects.php*

For further information please contact:
Gwyn Myer
Project Coordinator
Southern Oregon Forest Restoration Collaborative
gwynmyer@gmail.com

www.forestrestorationcollaborative.org

This report was collaboratively written by Gwyn Myer, Victoria Sturtevant, George McKinley, Jena DeJuilio, and Max Bennett