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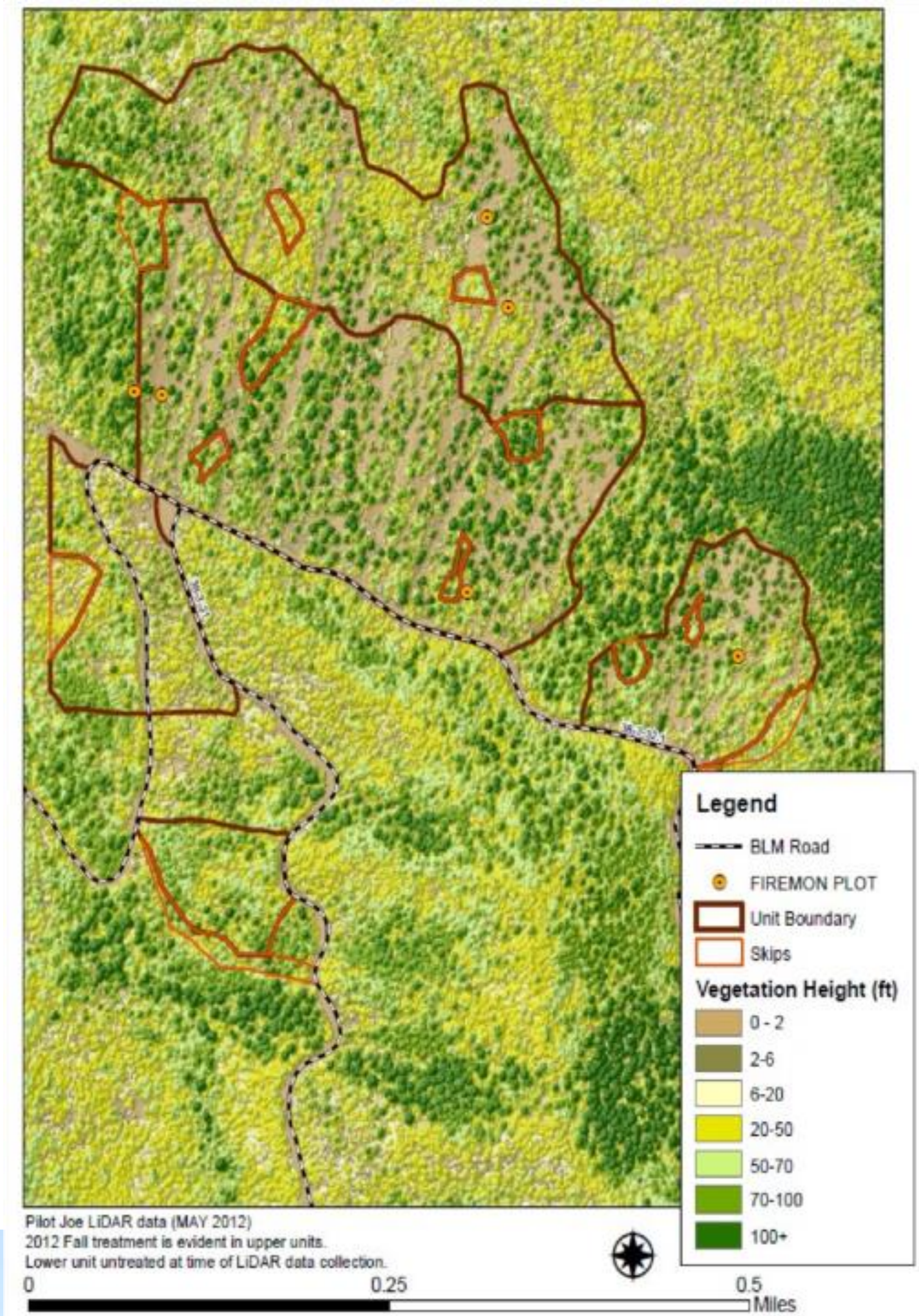
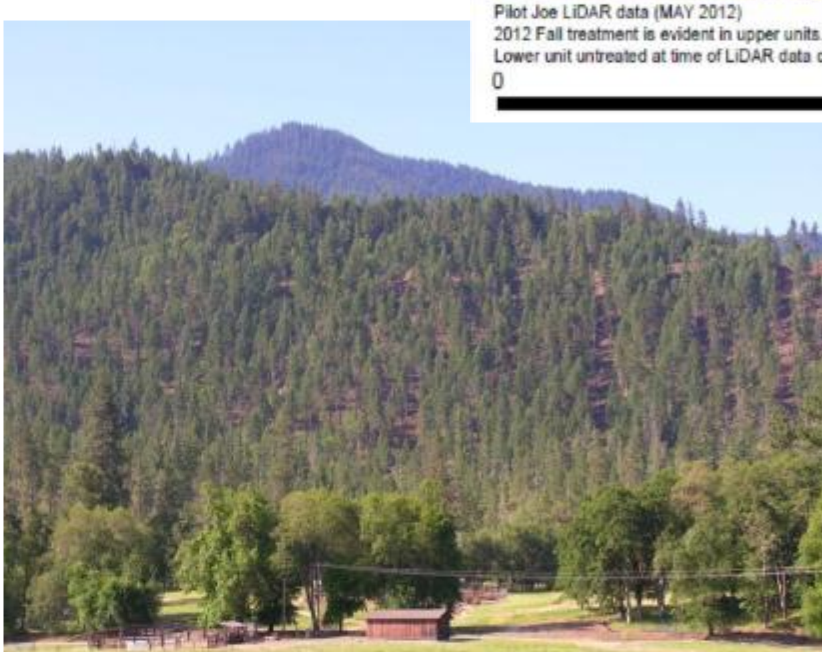


Pilot Joe Canopy LiDAR Imagery May 2012 - Amidst Treatment Implementation



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

Pilot Joe Multiparty Monitoring Summary of Results

May 29, 2014

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 became recognized as Pilot Joe and generated 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. There are 5 objectives the multiparty monitoring team was tasked to monitor:

Monitoring Objectives and Indicators

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

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.

Multiparty Monitoring Findings

The following pages provide a brief summary of 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. More detailed information will be available in a full report by the end of June 2014 and will be posted on the BLM website.

Photo Points

Several permanent photo points were established in the spatial heterogeneity plots, non-commercial units, yarder corridors, and commercial units throughout the project. 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.

Conditions at one of 20 FIREMON plots established one year prior to any treatments.

Conditions at the same plot immediately following the hand-piling of remaining activity fuels.

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.'

This permanent photo point was established by the Pilot Joe Multiparty Monitoring Team.

Summary of Results of Objective 1

Objective 1:
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 objective 1.

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
	Tree vigor	Growth Rates & Crown Ratio	No change
	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)
	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
	Snag and down woody material abundance	Condition and persistence	Small reduction in 15-20” size class snags Down wood not measured post treatment

Background The Pilot Joe Multi-party Monitoring committee determined that FIREMON methods and plot data would be used to measure and analyze identified indicators and metrics to inform two of the Multi-party Monitoring Objectives (Table 1).

Methods Twenty FIREMON plots were located and installed within the Pilot Joe commercial units in late summer 2011, prior to harvest activity (Figure 1). Plot locations were randomly generated within treatment units and stratified by plant series.

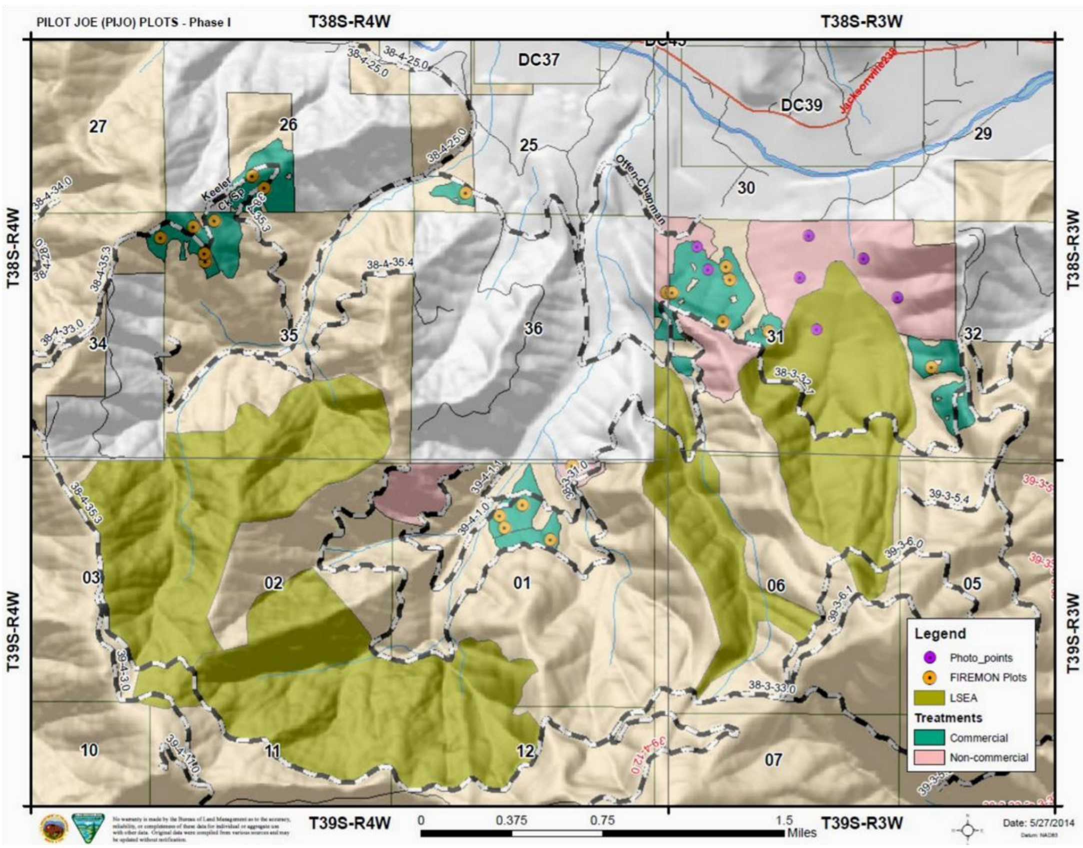


Figure 1. Pilot Joe (Phase I) treatments and plot locations. The light green areas were designated as the LSEAs, teal polygons represent completed commercial treatments, and the peach areas non-commercial treatments. The orange points represent the FIREMON plot locations and the purple circles are permanent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

RESULTS

Fire Behavior was modeled at the stand level in FVS-FFE for very dry (97th percentile) and dry (90th percentile) weather conditions. In general, treatments reduced crown bulk density, increased canopy base heights and follow-up handpile burning will reduce surface fuels. Passive torching and active crown fire was predicted for 40—100% of stands prior to treatments and 15—30% of the stands following treatment. The crowning index (wind speed required to initiate crown fire) increased from 17 to 36 mph and the predicted mortality was reduced from 94% to 22% under very dry conditions. Overall, treatments appear to have decreased the likelihood of crown fire and increased stand resilience and resistance to fire.

Tree Vigor— Radial growth rate was recorded for 31 trees as a measure of vigor. The average 10 year radial growth rate was 0.41 in. The average diameter at breast height (dbh) for these 31 trees was 18 inches (range 10-35.5 in) and the average tree age was 90 years (58-175 yrs). This metric was not measured immediately post treatment, as the anticipated initial response would be minimal. **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.

Stand level structural characteristics, including: mean diameter at breast height, crown ratio, basal area, and trees per acre. Post treatment data suggest an overall increase in diameter, decreased densities, and increased variability in stand structural characteristics. There was a large reduction in trees per acre (tpa), with a proportionally greater reduction in small diameter size classes. Basal area was reduced in all size classes. The greatest reduction (-74%) occurred in the 1-5" class, while the least (-9%) occurred in the 30+ size class. The remaining size classes were reduced 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.

Tree composition In general, the reduction of Douglas – fir provided for a more heterogeneous composition of species after treatment among most tree size classes.. Douglas-fir 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 represented 15% of the pre—treatment, and 21% of the post—treatment stand composition. In general, Pine and Oregon white oak species had minor representation. Seedling species composition followed a very different pattern than the average or larger size class trees, where Douglas-fir, Pacific Madrone, California black oak and canyon live oak represented nearly equal portions accounting for approximately 95% of the population, and shifted slightly post treatment. 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 differed slightly between strata. The Douglas-fir strata had slightly more average cover of understory species (62%) than the ponderosa pine strata (41%). All observed species were native. Grasses contributed to a majority of the understory cover. Species richness, the number of unique species, was greatest at the project level, when all plots/strata were considered. Understory species composition was not measured immediately following treatments, as the anticipated initial change would be small.

Snags and down wood— 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 1 or less per acre. Down wood was not sampled post—treatment.

Summary of Results of Objective 2

Objective 2:
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 3. Objectives, indicators and metrics established by the multi-party monitoring group and measured using spatial heterogeneity data.

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 cover variability (coefficient of variation) among sample points	Decrease in canopy cover; 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)	Trees randomly distributed with slight tendency toward clumpiness (minor increase over pre-treatment)
		Variability in distance between nearest & farthest neighbors (coefficient of variation)	Increase in variability of distance

Background: 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 (2009). Traditional thinning and fuels reduction often leaves relatively homogeneous forest structures; more variable forest structures may be beneficial for some wildlife species, may reduce crown fire potential, and may increase regeneration of desirable shade intolerant species and other plants, among other benefits.

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

- Canopy closure variation among five points separated by 100' transects
- Regularity of tree distribution (on a continuum from uniform to random to clumped)
- Variation in the distance to the nearest and farthest neighbor among four trees closest to plot center
- Presence, size, and number of gaps along linear transects

The protocol included measurements of the above metrics in "plots" that included five sample points separated by four 100' transects. 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.

Results: Results for each metric are summarized below.

- Canopy closure. Average canopy closure decreased from 75% before treatment to 46% after treatment. 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. 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. Following treatment there was a small increase in the number of points with a more clumpy tree distribution.
- Variation in distance between neighbors. Treatment increased both the average distance and the variability in distance between the nearest and farthest neighbors within sample points.
- 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%.
- Pre-treatment conditions in Pilot Thompson (canopy closure and Winkelmass) were very similar to those in Pilot Joe.

Conclusions: Overall, these results strongly suggest that fine-scale spatial variability increased following treatment. Canopy closure decreased as expected, but there was an increase in the variability of canopy closure as well – in other words, patches of denser canopy were intermingled with more open areas. Tree distribution was already random prior to treatment, and remained that way after treatment, with a small increase in tendency towards clumping. A more typical thinning treatment may have resulted in a more uniform or dispersed tree distribution. 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, another indicator of increased fine-scale variability. At a coarser 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.

Summary of Results of Objective 3

Objective 3:
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

Risk of fire to LSEAs was tested by modeling fire behavior under a Very Dry (97^{th} percentile) fuel moisture scenario and two different weather scenarios associated with the growth of historic wildfires in the Applegate (Squires Peak (2002) and Quartz (2001)), both before and after treatments (FARSITE, ArcFuels). An historic valley floor ignition was used to initiate the fire. Predicted fire spread to the LSEAs was highly dependent on wind speeds and directional alignment with topographic features, and ignition location. Under both weather scenarios, the treatments appear to have slowed fire spread to the LSEA located closest to the valley floor. Treatments had little effect on fire spread to the remaining LSEAs.

Summary of Results of Objective 4

Objective 4:
Generate jobs and support regional manufacturing infrastructure

Indicators:
- Board feet harvested
- Jobs
- Market utilization
- Efficiencies

The Pilot Joe Timber Sale provided employment along a trajectory that included project development, design, implementation, utilization and monitoring. 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. Less quantifiable benefits can also be cited, including personal and family well-being, skills development and ecosystem benefits.

Pilot Joe generated 2,075.65 mbf of material from commercial thinning on 248 acres, an average of 8,370 bf per acre. Recent Oregon Forest Resources Institute estimates suggest 1 mmbf of material removed and processed "creates or maintains" 11 forest sector jobs.

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. Forest sector employment provides 1 out of 20 jobs in Jackson County. Roadside collection of firewood occurred on the project, supplying local collectors.

Project efficiencies related to "skips and gaps" implementation were identified by the contractor, and relate primarily to earlier and/or more flexible contractor engagement in 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.

Pilot Joe treated 559 total acres. In addition to the 248 acres of commercial thinning noted above, fuels reduction work was completed on 532 acres and pre-commercial thinning occurred on 196 acres.

Summary of Results of Objective 5

Objective 5:
Gauge public support for pilots

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

FINDINGS FROM LEARNING CONVERSATIONS

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.

Pilot's departure from traditional projects accounts for its success:

- Process was more integrative, coordinated, collaborative, and principle-driven. Professors Franklin and Johnson were particularly significant to the success of the project, as were public involvement opportunities.
- Ecological principles of forest restoration and wildlife protection (e.g., LSEA methodology) guided the project; economic benefit (e.g., sustaining milling capacity) was a consideration.
- Spatial complexity and associated processes were emphasized, it was not a simple thinning project with diameter limits.
- Controversial practices were avoided in order to build consensus and public support.

Concerns:

- Project needs to be planned and implemented on a larger scale, but economic efficiencies are required, given agency budget constraints and desire for operator economic return.
- Skips and gaps implementation was problematic--creativity is needed in prescribing silvicultural treatments, flexibility required for implementation.
- Remaining slash and small material needs to be considered and service contracts need more use.
- Newly opened canopy and slash may increase fuel problem down the line.
- Monitoring needs more funding; learning should be applied to future projects.

Suggestions for future projects:

- Improve communication with contractor and transparency with community.
- Change contract language to be flexible to shifting needs and markets, employ more stewardship contracting.
- Ground-truth written contract regulations; have more contractor and community involvement in marking.
- Pilot a training program for fallers to understand prescription and objectives.
- Continue to incorporate good science; integrate monitoring up front; when an issue comes up, stop and assess.
- Incorporate other concerns such as invasive species and road decommissioning
- Avoid future litigation by applying lessons learned (communication, design, goals and principles).
- Scale up to the landscape level--planning (recommended by staff) and implementation (recommended by operator and industry).

Conclusions

Objective 1. Increase forest and ecosystem resistance and resilience.
Based on the measured indicators, results indicate that ecosystem resistance and resilience have increased thus far. 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.

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 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
The Multiparty Monitoring Team sponsored six guided conversations to capture diverse participant perspectives about the Pilot, to inform future project design and implementation, and to gauge public support for restoration forestry. Participants included community members, agency staff, and timber industry representatives. 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.

Management Recommendations

Based on the findings thus far of the multi-party monitoring team, it is recommended that restoration approaches continue in federal lands. The dry forest restoration approach developed by Drs. Franklin and Johnson is a good step toward an alternative management that can increase biodiversity, conserve and enhance important habitat, increase resistance and resilience of the forests to disturbances, and gain public support. Findings from the learning conversations provide recommendations for improvement and should be considered in future management activities. A finding consistent in the conversations was that restoration management be conducted at a landscape scale increase efficiency, derive ecological benefits at a larger scale, and be more economically viable. Monitoring is important to continue to ensure objectives are being met in both the short and long term, and that management can be informed and adaptive to achieve the best results. Transparency and trust are critical to public support for federal management.

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

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